FLIGHT and AIRCRAFT ENGINEER

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# The Outlook

## Full-scale Research

IF confirmation were needed of the excellent progress made in the development and production of British gas turbines, it is indirectly provided by the recent important announcement of the acquisition of a licence to build the Nene by the American Pratt and Whitney Company. How then, one may ask, can we justify the complaint that inadequate research facilities are handicapping development in this country? For example, Major Halford asserted during the discussion following Mr. Moult's lecture on the Goblin before the R.Ae.S. (reported on page 450) that he envied the Americans their research facilities, and Dr. Roxbee Cox echoed that statement.

Our present leading position is chiefly due to our pioneer work and to the brilliance of a few men starting with Air Comdre. Frank Whittle. We know only too well that no branch of the aircraft industry can start two or three years behind its rivals and hope to catch up in a few months. But we wish to preserve our lead in gas turbine development, and to do so each component and each unit must be improved in efficiency and in reliability under all conditions. If this is to be done we must have full-scale facilities for testing turbines, compressor units and even whole power plants under climatic extremes such as could be reproduced in the B.M.W. test cell at Oberweisenfeld, near Munich.

We have our Farnboroughs and our Lutterworths, and it is, of course, the co-ordinated efforts of such establishments and individual companies' laboratories that have carried the work so far. We have the assurance that the industries' needs are recognized and provision on a national scale will be forthcoming. While man-power and material shortages continue to hold up such provisions, we might well consider, like Pratt and Whitney, the possibility of converting the power plant of a surplus naval unit to help meet research requirements much as "the works" of ex H.M.S. *Bligh* may soon be assisting in testing Pratt and Whitney Nenes.

## Accident Statistics

FIGURES, it is said, can be made to prove anything. Aircraft statistics are no exception. In our issue of January 9th we published an article by an American contributor, who challenged the use of passenger-miles as a yardstick by which to measure the risks of flying. One or two readers from this country have since commented on this subject, and on May 1st we published a letter from the president of the American National Safety Council in which the passenger-mile basis was defended, with the reservation that no single figure can tell the whole story. This week we have a letter from yet another American reader, Rear Admiral Reeves, U.S. Navy, who also defends passenger-miles.

Mr. Dearborn, in his May 1st letter, admits that in the air the risk is probably not in direct proportion to the distance. Admiral Reeves, in this week's issue, does not consider that at present we are justified in holding the view that the risk occurs mainly at take-off and landing, and that the rest of the time is comparatively safe. If this were so, the Admiral says, then a long flight with only one landing and one take off would be less hazardous than a short flight with a number of intermediate stops.

We believe that even at the present time this is actually the case, on some routes at least, but the difficulty is that so much depends upon the nature of the routes, geographical conditions, weather and so forth. For example, many landings in poor visibility obviously present greater risks than a single landing in clear weather, and it is not possible to compare, on a passenger-mile basis, internal routes in Great Britain in winter with, for example, the South Atlantic run. In the one case the risk comes chiefly from the weather; in the other from but two main sources: mechanical trouble in the aircraft, or striking high ground on portions of the route through being off-course due to faulty navigation.

Mechanical failures are comparatively rare in modern

times, and when better maintenance facilities and more men become available, they should be very rare indeed. Similarly with navigation on long routes. When proper equipment has been installed on the routes and in the aircraft there should be no excuse for an aircraft to be unwittingly off its course, and thus the risk from high ground should not arise. At the present time that risk does exist because of the inadequacy of equipment on many routes.

So far as the travelling public is concerned, statistics have no effect whatever. The appalling death rate on our roads makes no impression. The daily papers must bear a large portion of the responsibility for any falling-off in air passenger bookings. So many of them splash every air accident across their pages in huge type, and even when, as was recently the case, an official report is issued on some crash that took place months ago, a few of them present the findings of the report as if the accident happened the previous day.

So long as that sort of presentation persists, all the statistics in the world will not impress the travelling public with the safety of flying. The announcement by I.A.T.A. that 42 out of 60 airlines had no fatal accidents during 1946 (a good record, but one which must become even better) leaves no impression. A single accident prominently displayed does. Incidentally, the I.A.T.A. report that several airlines have unblemished records for from six to 17 years appears to bear out our contention that route conditions have much to do with the safety or otherwise of operation.

## Wait and See

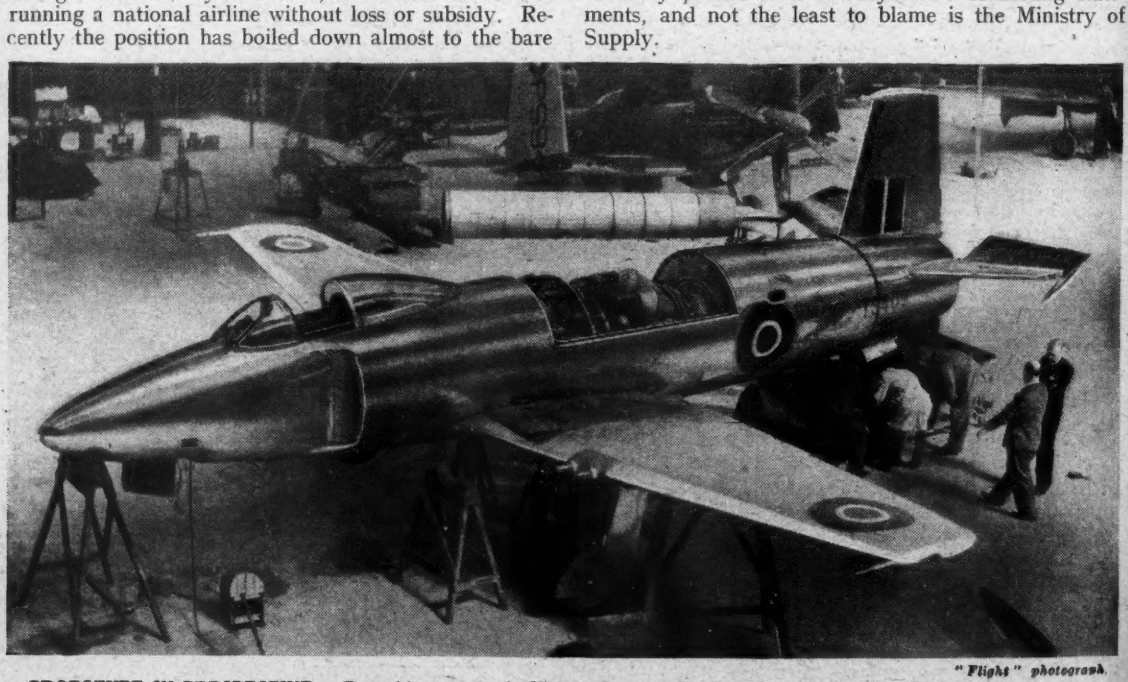
WE had hoped that the next time the Tudors were mentioned it would be to say that they had commenced operation on one or other of our air lines. The whole conception of interim types, or at least the timetable at first associated with them, has changed in the last year or two, as also has the idea of running a national airline without loss or subsidy. Recently the position has boiled down almost to the bare need of keeping our air routes open with British aircraft regardless of cost (excluding dollars) or efficiency.

However, A.V-M. Bennett, speaking on behalf of B.S.A.A., has now tried to kill the idea that the Tudor is an interim type, and he has described it as a civil transport designed on the most modern lines and superior in overall qualities to any other type now flying. Many improvements are known to have been made since the depressing report on the performance of the B.O.A.C. Tudor I on an African proving flight, and the Tudor IVs for B.S.A.A. may well turn out to have some very different characteristics. The Air Vice-Marshal is a good judge of aircraft and a very hard man to please. His statement must cause critics to pause for a moment and ask themselves whether it is not just possible that Tudor shortcomings have been exaggerated. We hope wholeheartedly that A.V-M. Bennett is right, for a British aircraft deserving of such high praise, flying on our air routes this year, would do much to re-establish British prestige. The final verdict can only be given when a considerable accumulation of operational experience becomes available.

In the interests of British aviation the Tudor position should be cleared up. There is a controversy because so many parties have already made conflicting statements, and not the least to blame is the Ministry of Supply.

CONTENTS


| | |
|---|---|
| Outlook | 433 |
| Portsmouth Air Display | 435 |
| Ercoupe in the Air | 437 |
| Naval Aircraft | 438 |
| Development of the Goblin Engine | 442 |
| Here and There | 444 |
| Attacker | 446 |
| Civil Aviation | 451 |
| Correspondence | 455 |
| Service Aviation | 456 |

*"Flight" photograph.*

**PROTOTYPE IN PERSPECTIVE:** From his perch in the Vickers-Supermarine hangar at Chilbolton, *Flight's* cameraman sees the first prototype of the Attacker jet fighter prepared for its latest series of flight trials, now under way. A second Attacker will soon fly and a third is well advanced. The Attacker is the subject of a special illustrated description on pages 446-450.

# Portsmouth Air Display

## *An Enjoyable Day for 10,000 People*

Clarke's Percival Proctor I passing the home pylon (at right) to finish the race in third place.

THE weather on Saturday, May 10th, for the Portsmouth Air Display and Garden Party was not too unkind, certainly it was very cloudy and a brief shower of rain did fall but, to offset this, visibility was pretty good and there was negligible wind.

Owing to an attack of laryngitis Lord Nathan was unable to be present to open the show, but Mr. George Lindgren, Parliamentary Secretary to the M.C.A., did the honours on behalf of his Minister.

A goodly selection of aircraft types were present and, except for the almost inevitable slight lapses in the sequence of events, interest was on the whole sustained remarkably well. A mixed bunch of Spitfires, mostly 16s, of 501 Squadron, A.A.F., opened the active part of the afternoon's programme by flying past a few times and ending their turn with a gentle beat-up.

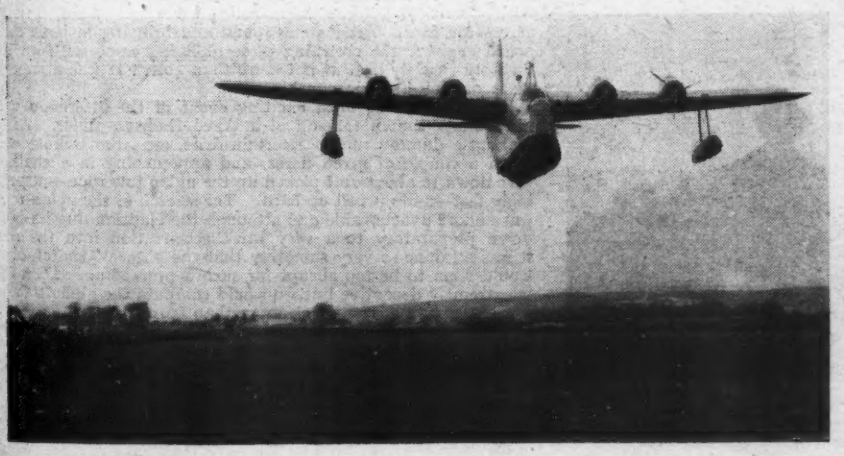
These were followed by a Scud III sailplane towed off by a Tiger Moth, which event heralded the arrival of F/O. Carter in his Vampire. Considering the low cloud base—of the order of 600-800ft—Carter put up a truly impressive performance, and for those who were seeing a jet fighter demonstrated for the first time it was undoubtedly a considerable event. The Vampire having left for home, the Scud III came in for an individual landing, but before putting down, the pilot, Mr. Clear, did show the crowd as well as he was able in the prevailing conditions just of what a powerless aircraft is capable.

To act as substitute for the arranged helicopter demonstration—which, due to extraneous causes, was cancelled—a de Havilland (Canada) Chipmunk was demonstrated, this being the only model of its kind so far to have arrived in this country. Truly it is an appealing little machine, and after seeing a performance in which its docility and tractability were ably demonstrated in a very nicely executed series of aerobatics, there would seem to be little doubt that a very high degree of popularity will be achieved.

### *NEAT DROPPING*

The programme was originally planned to include a drop of three sticks of paratroopers, but since the only available paratroops were men under training, the authorities considered it too dangerous and accordingly drops of supply containers were substituted. Two Halifaxes came over at approximately 600ft and the containers could clearly be seen in the bomb bays. The judgment of the aircraft's position in relation to the crowd for the drop was extremely fine, the containers being released almost directly above the front rank of spectators so that the gentle quartering wind landed them about 300ft away directly before the mass of spectators. It was unfortunate perhaps, but not critical, that the parachute of the first container in the leading stick tangled with that of the second container; however, the rate of descent of effectively two containers on one parachute did not seem to be very much higher than that of the remainder.

A silver cup, to be won outright, was presented by Mr. W. E. Percival to the winner of the light aircraft race. The entries made a useful cross section of types, which were started on the three 15-mile

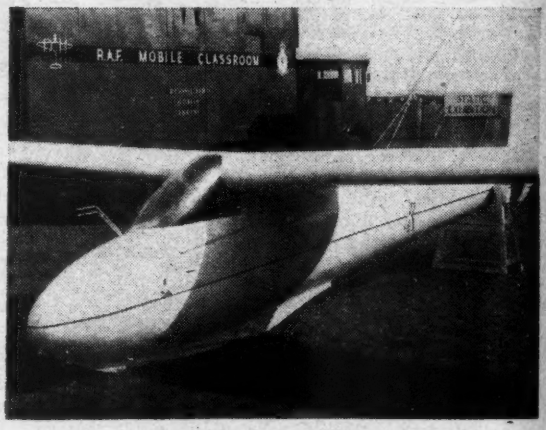


Very low, very slow and perfectly handled, the Short Hythe put up a performance which stole the show.

laps by Major General Loughborough. Messrs. Dancy and Rowarth were the official handicappers and they certainly did their work well for the closing lap was extremely close. Ken Waller flew his Miles Messenger first past the finishing line but was subsequently disqualified for, it is said, cutting a turn, so the first prize went to Burke on a Tiger Moth who just pipped Tommy Rose in the Hawk Speed VI to the post. Clarke's Proctor I was third and he was followed home by Guild in the second Tiger Moth. Mitchell's Magister came into fifth place and Miller in an Auster J IV and Sproule in the tiny Aeronca were respectively sixth and seventh. The winner's average speed was 104.5 m.p.h., but the three fastest aircraft were the Hawk VI at 171.5 m.p.h., the Proctor at 145 m.p.h., and the Magister at 120 m.p.h. A Bibi BC550 entered by Mole, and Mechin's Comper Swift were non-starters.

F/O. Carter putting up his very fine display with the de Havilland Vampire. Not even the dull conditions could subdue the appeal of this event.

On the point of having a jerk put into it: the Waco Hadrian immediately prior to being snatched off.




Behind the Scud II sailplane in the static exhibition can be seen the mobile classroom van in which full instruction is given on the D.H. Goblin.

The next events to hold the spectators' attention were fly pasts by the B.E.A. Viking G-AHPK *Veracity* and the B.O.A.C. Hythe G-AGEU *Hampshire*. The Viking was impressive, quiet, fast and, although of not much interest to potential passengers, patently manœuvrable. The show put up by the Hythe was truly magnificent. After a couple of fairly low fly pasts followed by quite steep climbing turns, the Hythe came past again with both outboard airscrews feathered and, with about two-thirds flap, fish-tailed slowly and quietly across the field. After going round and bringing in both outboard engines, the crowning piece of flying came with an incredibly slow fly past at not more than 40ft. It was a superb piece of aircraft showmanship.

Undoubtedly the most exciting event of the afternoon was the Dakota snatch take-off of a Waco Hadrian glider. After making a dummy run to ascertain drift, etc., the Dakota was given a couple of green flares, and approaching in a shallow dive down to about 20ft picked up the nylon tow rope—surprisingly fast—and opened up hard. The stretch of the nylon rope was almost unbelievable and although the Hadrian dug its nose down preparatory to a very brisk acceleration into the air, it was all done so very smoothly that the phrase "snatch-off" would seem to be too abrupt for such a proceeding. Distance is extremely deceptive but we would compute the glider's take-off distance from rest at no more than 80-100 yards.

With an exhibition fly past of pretty well all the aircraft present, the flying part of a very successful display came to a close. In this connection it is worthy of mention that an Ercoupe was among the visiting aircraft (from Belgium) and a very attractive little machine it appears to be. Another foreign visitor was the KZ-III Lark, powered with a Continental engine.

# ERCOUPE IN THE AIR

## *Flight Impressions of American Two-Control Two-Seater*

**In America the two-seat, two-control Erco Ercoupe costs about £700. The span is 30ft and the gross weight 1,260 lb. It lands at 48 m.p.h. and climbs at 700ft/min. with a 75 h.p. Continental engine.**

FOR some weeks past the Engineering and Research Corporation of Maryland have had one of their attractive little Ercoupe personal tourers flying on the Continent, and now it is visiting this country. Last week-end I examined it and flew it from the West London Aero Club, at White Waltham.

It is only right to say that, partly through ignorance, I found myself a little prejudiced against two-control flying. Any suggestion of reduced control movements and restriction of manœuvres rather went against the grain. After landing from the all-too-short flight, however, I am definitely a two-control convert as far as the Ercoupe and types designed for similar purposes are concerned. There is little doubt that the average owner with limited experience would find that this spin-proof, steering-wheel-type machine suited his requirements very well, and that an experienced pilot would appreciate the logical ease with which the Ercoupe is controlled in flight or on the ground. I was very sorry that Mr. J. L. Zenitz, who is demonstrating the aircraft over here, had other commitments which prevented me from making a longer flight.

In the cockpit an attractive and simple layout of instruments is provided and radio is built into the panel. Two small control wheels of the push-pull variety protrude from the panel, and the central throttle is a large knob with in-and-out movement. The floor space is quite clear except for a single brake pedal on the port side. I still have a preference for a lever-type throttle and would prefer a larger wheel.

The days of swinging are definitely past. On the Ercoupe, when ready to start, one steps in and presses the button. Ease of entry is well looked after, and a small provision, simple yet effective, enables the seat to be used as a step. A flap of leather, backed with a canvas-like material, folds up over the seat—no dirt, no damage, no trouble. The loop aerial is rather precariously placed on the top of the windscreen, where one might expect to find a handle to assist in getting in and out.

Taxying is made easy by the steerable nose wheel and good forward vision. Although the grass was rough and we taxied fast, there was very little pitching, and sharp turns were quite in order.

There should never be much trouble on take off with a tricycle—large or small; the Ercoupe picks up its flying speed of about 50 m.p.h. (two up) quite quickly, and it is then up to the pilot to pull it off when he is ready. The climbing attitude is steep and the best speed seems to be around 60 m.p.h. The only time I felt a little blind was with nose high up on the climb. A horizontally opposed engine has the defect of necessitating a very wide, if shallow, nose cowling, and this tends to obstruct the down-inclined forward view. Rearwards, sideways and straight forward one sees very well.

The climb and forward speed are good for 75 h.p. maximum and about 60 h.p. for cruising. The level speed built up to around the 110 m.p.h. claimed for cruising even though the air was pretty bumpy. The rough air made the testing of two controls more interesting, and a brief hand-off check indicated good stability. I instinctively pressed the floor boards to correct real or imaginary yaw, but soon forgot the lack of rudder after tucking my feet in towards the seat.

Of course, I stalled the aircraft and tried to spin it, but achieved nothing more than a one-wing-low "sag" at about 42 m.p.h. with power on and 45 m.p.h. without. Even when the aircraft seemed fully stalled the ailerons gave some control and as soon as the nose dropped there was immediate response to the wheel. Tight gliding and power turns with nose pulled well up could be held right down to near stalling speed, and the final reaction was to fall very gently into a less banked more nose-down attitude.

There are certain vibration periods on the Continental C75-12F engine which need to be avoided, but at 2,275 r.p.m. all is quite smooth and there is little engine or air noise. The cabin is well sealed and conversation can be carried on without any strain.

One approaches to land on the Ercoupe at about 70 m.p.h. with a trickle of motor for smoothness. It is not, of course, possible to side slip, and, in keeping with the simplicity policy of the makers, there are no flaps. Any excess height must be lost on "S" turns or by holding the nose up and sinking.

The landing, like other manœuvres, is simple; to level off and fly on would be safe, but a little hold-off is desirable. Once down, stick forward puts the nose wheel well on the ground and brakes may be used at once.

The fuel system deserves a mention. Two nine-gallon interconnected tanks are placed in the wings, and they feed by pump into a third six-gallon gravity-cum-reserve tank behind the instrument panel. A gauge is fitted for the wing tanks and an indicator on top shows when only the reserve is left.

Any pilot could fly the Ercoupe safely and would enjoy the experience of its finger-light controls and simplicity. A solely Ercoupe pilot would not have such a comfortable ride on the more normal three-control, spinnable types. M. A. S.

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### ANNIVERSARY

ON May 1st the Tasman Empire Airways' trans-Tasman service celebrated the completion of seven years' successful operation, including the war period, during the whole of which they have maintained a regular passenger service between New Zealand and Australia.

### APPLIED PHOTOGRAPHY

THE Kodak Exhibition at Australia House, Strand, W.C.2, which is open to the public for May 15th and 16th only, shows the manifold uses to which photography can be put to the service of industry to-day. All phases are shown, from a photoelastic stress analysis of gas turbine blades to an example of motion study of form design.

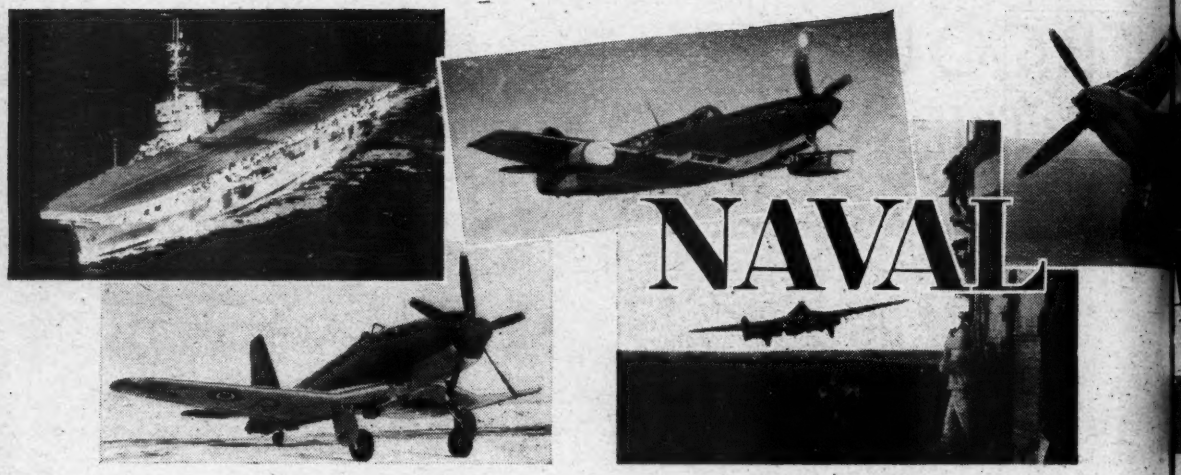
The whole exhibition has a very modern touch, and the aircraft interest is particularly prominent. Examples are shown from the Royal Aircraft Establishment, Ministry of Supply, both Aircraft and Engine Divisions of de Havillands, Royal Canadian Air Force, High Duty Alloys, Handley Page, Ltd., Gloster Aircraft and Cellon.

### PRATT AND WHITNEY NENES

THE Pratt and Whitney Aircraft Division of the United Aircraft Corporation will begin tooling immediately for the manufacture of the Rolls-Royce Nene turbine jet in the U.S.A. This has lately been announced by Mr. W. P. Gwinn, general manager of the Division, and follows the remarkable success of the Nene in passing the U.S. Navy's 150-hour type test. Meantime the U.S. Navy's Bureau of Aeronautics has announced that the Nene will power a new Grumman deck-landing fighter.

It is emphasized that development of turbine units to Pratt and Whitney's own design will continue; in fact, a P. and W. turbine has already reached the testing stage. A gas turbine laboratory will go into operation late this year.

Negotiations for the Nene were conducted through the Taylor Turbine Corporation of New York.




A FULL-DAY discussion on naval aircraft was held at the Royal Aeronautical Society on May 7th. In the morning Mr. W. S. Farren, C.B., M.A., F.R.S., F.R.Ae.S., technical director of Blackburn Aircraft, Ltd., surveyed the technical problems of the design of naval aircraft, and Mr. L. Boddington, Superintendent, Naval Aircraft Section, Royal Aircraft Establishment, dealt with equipment. After lunch Cdr. F. M. A. Torrens-Spence, D.S.O., D.S.C., R.N., lectured on operational flying.

It is possible this week to summarize only the first two papers, reserving until next week Cdr. Torrens-Spence's contribution and the discussions on all three lectures.

Mr. Farren wished it had been possible to include the aircraft carrier in the introductory papers and felt that the discussion would be incomplete without contributions from ship designers.

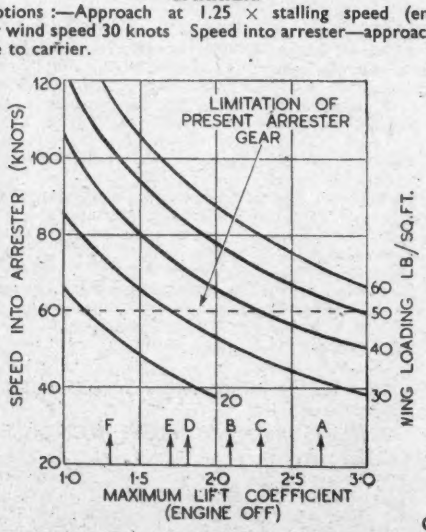
There was no essential difference, he said, between the functions of naval aircraft, which he defined as aircraft operating from ships, and those of land-based aircraft; but there was a difference of emphasis. In future the chief functions of naval aircraft would be the attack of hostile submarines, aircraft and ships—probably in that order of importance. There would continue to be two main kinds of carriers: specialized carriers amenable to the same processes of research and development as aircraft; and simpler, smaller and slower ships, which would be required in numbers at a time which could not be accurately foreseen, and must be provided then by the conversion of ships designed for other purposes.

### Flexibility

Naval aircraft must be armed with both weapons and radar. The appearance at the right time of the perfect aircraft, properly armed, was difficult to plan, but Mr. Farren thought that the best way to approach this ideal was to prefer a flexible layout, where fairly large changes in substantial components could be made without affecting other components or efficiency. Moreover, flexible layout made a versatile aircraft, and while guarding against "general-purpose" aircraft of no merit,

**LANDING A JET PROPELLED AIRCRAFT ON A FLEET CARRIER.**

Assumptions :—Approach at 1.25 × stalling speed (eng. off). Carrier wind speed 30 knots Speed into arrester—approach speed relative to carrier.

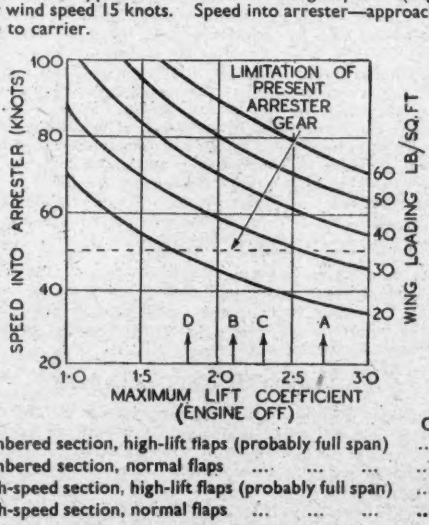



| | Cl. Max. |
|---|---|
| A. Cambered section, high-lift flaps (probably full span). | ... 2.8 |
| B Cambered section. Normal flaps.... ... ... | ... 2.1 |
| C. High-speed section, high-lift flaps (probably full span). | ... 2.3 |
| D. High-speed section, normal flaps. ... ... ... | ... 1.8 |
| E. Swept-back wing, high-speed section (special lift devices). | 1.7 |
| F. Swept-back wing, high-speed section. Large flaps. | ... 1.3 |

Graph shows the relation between wing loading (at landing weight) maximum lift coefficient and speed into arrester.

**LANDING AN AIRSCREW-DRIVEN AIRCRAFT ON A POCKET CARRIER.**

Assumptions :—Approach at 1.1 × stalling speed (eng. off). Carrier wind speed 15 knots. Speed into arrester—approach speed relative to carrier.




| | Cl. Max. |
|---|---|
| A. Cambered section, high-lift flaps (probably full span) | ... 2.8 |
| B. Cambered section, normal flaps ... ... ... | ... 2.1 |
| C. High-speed section, high-lift flaps (probably full span) | ... 2.3 |
| D. High-speed section, normal flaps ... ... ... | ... 1.8 |

Graph shows the relation between wing loading (at landing weight), maximum lift coefficient and speed into arrester.

*SUMMARIZED on these pages are two of a series of three papers delivered on May 7th at a full-day session of the Royal Aeronautical Society, held at the Institution of Civil Engineers. They are :*

*(a) "A Survey of the Technical Problems of the Design of Naval Aircraft," by Mr. W. S. Farren, C.B., M.A., F.R.S., F.R.Ae.S.*

*(b) "Naval Aircraft and Carrier Equipment," by Mr. L. Boddington.*

*During the same session Cdr. F. M. A. Torrens-Spence, D.S.O., D.S.C., R.N., lectures on operational flying. This, together with the General Discussion, will be dealt with next week. Mr. W. G. A. Perring, F.R.Ae.S., showed films of deck landing.*

# *Design Problems and Equipment Discussed Before R.Ae.S.*

he saw no reason to believe that a high degree of versatility should be incompatible with technical quality.

Though some naval aircraft might not attain the highest standard of technical efficiency, in the narrow sense, this was due to exceptionally difficult operational requirements rather than to the fact that they operated from ships, but there were types for which, he believed, a more thorough exploitation of the potentialities of the carrier could assure technical and operational efficiency perhaps higher than that of comparable land-based aircraft. To this end the carrier designer must make a contribution.

Calculations concerning take-off from the "higher class" of carrier did not disclose any outstanding technical problem until we came to aircraft of very high speed, leading to swept-back wings and a low maximum lift. For these, and for the majority of first-line naval aircraft, Mr. Farren believed that take-off would become more and more a responsibility of the carrier. Free take-off would be practicable, but an enterprising development of A.T.O. could provide operational advantages far greater than any development of the aircraft which he could foresee.

### Using the Carrier's Power

The power available in the carrier, he felt, had never been fully exploited on behalf of its aircraft. It could be used directly, he suggested, to project the aircraft into the air under any conditions and at a rate greatly exceeding what could be achieved by any combination of the aircraft's own power plant and catapults and rockets as we knew them. He saw no reason why the many handling problems to be solved could not be overcome.

For the second-line ship such developments were not practicable, and free take-off was essential. There seemed no good reason why rockets should be excluded. The present view—that they should be reserved for emergencies—was unlikely to survive. Concerning take-off from this class of carrier, Mr. Farren said that with appropriate and economical thrust-weight ratios there was still something to be gained by a rise in lift, but it was doubtful whether elaborate developments in the direction of very high lift coefficients would pay. They would be most useful in emergencies, when rocket assistance, a far lower economical burden on the aircraft, was surely acceptable.

It was chiefly in the landing of aircraft on carriers that aircraft design had still a long way to go; this applied particularly to the "higher class" of aircraft, which would gain particularly by an improvement in the lift coefficient under approach conditions. It seemed to the lecturer surprising that so little had been done to exploit aerodynamic devices to this end. We needed a relatively high lift coefficient under conditions of entirely satisfactory control and therefore, almost necessarily, remote from the condition of the stalled wing. We had still to exploit the potentialities of flaps, slots, spoilers and suction.

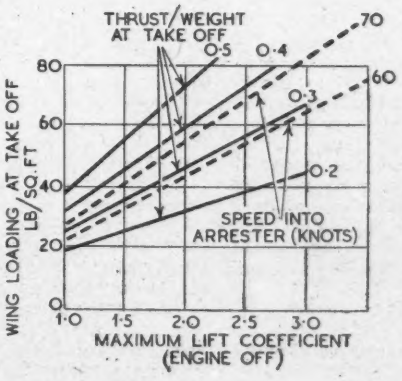
In the past, approach speeds and conditions were such as to make a small margin, in relation to the inevitable collapse at the stall, an acceptable risk; but in future the consequences of a mistake would be too serious. What was needed was freedom from vice at the stall, combined with first-class control at an appreciably higher speed, and a first-class view. The burden was then on the arrester.

Even with special aerodynamic devices, the maximum lift coefficient of the "higher class" of aircraft was likely to be low, and there would be a big reward for increasing the speed acceptable by the arrester. A rise of 10 knots in the neighbourhood of 60 knots led to an aircraft gain about equal to that obtainable by raising the maximum lift coefficient by 0.5—namely, an increase in permissible wing loading of 20-25 per cent. The take-off thrust/weight ratio available was likely to suffice for free take-off using the full deck length.

For the more modest aircraft, where take-off must be

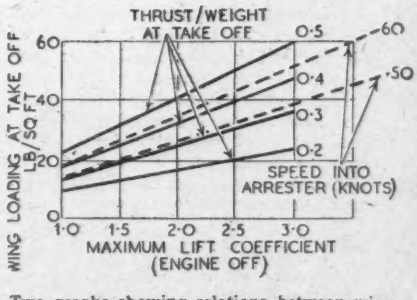
**JET AIRCRAFT AND FLEET CARRIERS.**

**Assumptions :—Take-off distance 700ft. Carrier wind speed 30 knots. Take-off speed 1.1 × stalling speed (eng. off). Approach at 1.25 × stalling speed (eng. off). Landing weight 80 per cent of take-off weight.**




**AIRSCREW-DRIVEN AIRCRAFT AND POCKET CARRIERS.**

**Assumptions :—Take-off distance 400ft. Carrier wind speed 15 knots. Take-off speed 1.0 × stalling speed (eng. off). Approach at 1.1 × stalling speed (eng. off). Landing weight 92 per cent of take-off weight.**




**Two graphs showing relations between wing loading at take-off and max. lift coefficient (eng. off) for fixed values of thrust/weight at take-off and speed into arresters.**

## NAVAL AIRCRAFT

under the machine's own power, the present arrester speeds were probably high enough for a good economic compromise. A good maximum lift coefficient could be attained on such aircraft without abnormal devices, but a rather higher lift coefficient, available for take-off and approach, would be worth while so long as the means of attaining it were light and simple.

Mr. Farren went on to make one of the most interesting points in his lecture, remarking that a carrier was the only kind of airfield where it seemed likely to be practicable to transfer the shock-absorbing mechanism from the aircraft to the deck. At the same time it had available the power for mechanizing the handling of the aircraft on the deck, without the aircraft itself having any wheels. Elimination of the undercarriage would result in a reduction in drag and weight, increased stiffness, better ducting for a jet unit, and improved fuel capacity, and Mr. Farren believed that the resulting aircraft would be superior to its land-based counterpart. "This," he said, "seems to be a case where the undoubted difficulties and disadvantages are rather a statement of what has to be overcome than a reason for not making the effort."

When everything possible had been done to reduce the burdens imposed by wing-folding and an exceptionally strong undercarriage, it must be recognized that they did lead to a rise in structure weight, and this emphasized the difficulty of meeting the range requirement. Three factors were of equal importance in this respect: the greatest possible amount of fuel; a high efficiency of conversion; and a low drag. This point was particularly emphasized.

The lecturer went on to refer to "efficiencies of conversion." With an airscrew efficiency of 80 per cent and a specific consumption of 0.45 lb per b.h.p./hr, the figure for the petrol engine was 24 per cent. For the gas turbine, with the same airscrew efficiency and about a 50 per cent higher consumption, it was about 16 per cent. For a jet unit consuming 1 lb of fuel per hr per lb thrust it was 10 per cent at 300 m.p.h., rising with speed. Even allowing for the differences in weight of the power units, and for the lower drag of the gas turbine and jet aircraft, there would be a big reward for a substantial reduction in the fuel consumption of gas turbines and jet units. This was particularly important at outputs of the order of three-quarters of the maximum.

It was, of course, more than likely that more economical turbines would be heavier. No decision was possible until we had more information, but for naval aircraft, where the operational requirement of large radius of action and long duration was likely to increase, it was important that we should know what could be done. It seemed early yet to accept that nothing better than the jet unit was possible. This type of unit could be given a higher efficiency by what amounted to a mechanically efficient way of entraining more air and increasing the size of the jet. Despite the ducting problem and the probable weight penalty, there was a prospect of a good dividend.

All things considered, naval aircraft had a special interest in essentially economical power units. This was in no way an argument for the large, heavy, high-drag unit, but a challenge to those who had produced outstandingly light and powerful units to recognize that aircraft had, in more senses than one, "a long way to go."

# EQUIPMENT

IN his Paper on Naval Aircraft and Carrier Equipment Mr. Boddington presented history and elementary facts in an admirably lucid manner, but it will be possible here to deal only with some of the less familiar aspects. One historical fact which must, however, be recorded is that in 1928 Mr. Salmon, at Farnborough, worked on the rocket-assisted take-off problem, and his investigations, which have recently come to light, have shown that had the idea been developed R.A.T.O. would have been accomplished before 1941.

Introducing his Paper, Mr. Boddington pointed out that it was now the practice to refer to all methods of mechanically assisted take-off as "catapulting," to bring nomenclature into line with American practice. To-day, he said, both the "trolley" and "towing" methods of catapulting were in use, the former in conjunction with the Firefly and Barracuda, but the towing method was now accepted and the trolley was obsolescent. The towing method had come to be called the "tail-down" method, but the introduction of nose-wheel aircraft might force a change in title.

### Catapult Gear

The hooks (or hook) on the aircraft were attached to a towing hook on the deck by a steel wire-rope bridle. The aircraft was held back against airscrew thrust by a "hold-back" link engaging a suitable fitting at the rear of the fuselage (for tail-wheel aircraft), anchored to the deck. The system was tensioned through a hold-back link to a predetermined load prior to full take-off thrust. Under this thrust the aircraft strained forward and tended to slacken the tow-rope, and the initial tension must be such that the rope remained tensioned to some degree to avoid slack, and therefore snatch loads, on launching. The launch was started as soon as the accelerating forces, applied through the deck hook, were sufficient to rupture the breaking link in the hold-back unit.

Positioning the aircraft was much simpler with this method as there was no obstruction by trolleys. The aircraft approached obliquely, the starboard main undercarriage wheel engaged the guide board, and the aircraft, still under taxying power, swung straight. A tail board prevented the tail wheel over-swinging the centreline, and the aircraft ran forward against its chocks in a central position.

The accelerating loads were applied through a pair of hooks so disposed that the towing forces acted through, or close to, the c.g. under static conditions. Careful attention had to be given during the design stage to the angle of the towing bridle and the hold-back link, to keep the undercarriage loads within normal design requirements.

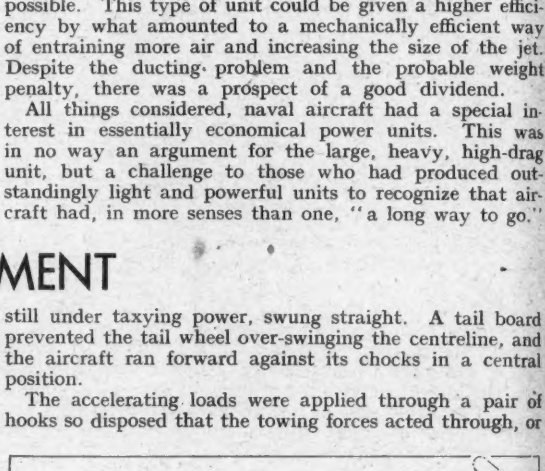


Diagram of method of positioning aircraft for tail-down launching.

Dealing with under-deck machinery, the lecturer said that in early catapults the launching energy was obtained from cordite charges, but, in view of the need for short time intervals between launches, this source of energy was not practicable. On an experimental equipment installed

## NAVAL AIRCRAFT

at Farnborough launching intervals of one minute were obtained from a cordite-operated accelerator, but compressed air was the energy medium now used, with hydraulic control on the front side of the piston. The air acted directly on the power piston, the motion of which was controlled by the leakage of water from an annulus in front of it. This control was provided by a launching valve, of sluice type, opened under constant force against a dashpot, the orifice of which was varied by the motion of the valve. The piston, ropes and trolley were brought to rest by a "swollen" part of the piston rod, in front of the piston, passing through a choke ring and forcing water through a decreasing annular orifice formed by this ring and the retardation profile.

In present-day installations retardation was effected in 21ft (compared with 96ft for acceleration), giving a mean retardation of 9.2 g and a probable maximum of 12 g. With the towing method this was not so fundamental, as there was no launching superstructure to collapse rapidly. In the American equipment retardation was effected by external buffers, similar to railway hydraulic safety buffers, acting directly on the power piston.

On British carriers the maximum build-up of acceleration took place in approximately 0.6 sec., but with American equipment this was of the order of 0.3 sec. It had been found that after the aircraft broke away from the hold-back there was a drop in load transmitted to the towing hooks, and that this depended on the weight and elasticity characteristics of the aircraft and moving parts. There was a tendency for the oscillating effort to increase with the size of the hold-back breaking load, and this was affected by the characteristics of the undercarriage and airframe.

Discussing the stability of aircraft during launching, Mr. Boddington said that little could be said at this stage of the nose-wheel layout. If the nose wheel rested on a platform which was part of the deck towing hook, then no stability problems arose, but strength requirements might still be important. This was a serious complication, and at Farnborough it was considered that two hooks should be used on the aircraft. A few launches which had been made with the Airacobra indicated a definite drift of the nose wheel, up to about 12in, but it was probably unfair to quote this case as the nose wheel was stiff and had little or no castering effect.

### Acceleration Effects

From the pilot's point of view the accelerations now used, which were of the order of 3.25 g, caused no discomfort. Pilots agreed that the launch was much more comfortable when the build-up from breakaway to maximum was of the order of 0.6 sec., compared with 0.3 sec. or less. Crew positions, facing forward or aft, caused no embarrassment, provided that there were proper supports.

Having summarized the history of R.A.T.O., Mr. Boddington recalled that the need for a rocket with a burning time of 4 sec resulted in the development of the present 5in motor, about 4ft long and weighing 65 lb. Nozzle sizes were chosen to suit Arctic, temperate and tropical conditions. The limits of burning time were 3.7 to 4.7 sec, depending on temperature, and the total impulse about 4,600 lb/sec. The cone of the jet included an angle of 26 deg and in general all airframe parts should lie outside this boundary.

In operation the pilot started his run in the normal way and at a speed of about 24 knots (interpreted to him in terms of distance) the rockets were fired. It was imperative that the rockets should not fade out before take-off speed was reached. In contrast to a normal free take-off run, the pilot made no attempt to get the tail up, and a better take-off resulted if the tail were kept down.

Introducing his remarks on arrester gear, the lecturer said that the design requirements remained at 1.5 g retardation until recently, when the figure was increased to 2 g to meet the needs of higher-performance aircraft, since the deck space would not permit an increase in the arresting distance. Entry speeds had not yet changed.

Arrester wires, made of 6/37 extra-flexible steel ropes, were connected to the main reeving by pin couplings. The rope supports could be collapsed by an aircraft wheel and would reset immediately; they could be held permanently collapsed by an air piston and cylinder. British and American carriers were similar in the deck equipment and its layout.

Concerning arrester hooks, Mr. Boddington said that design conditions now required the hook installation to take working retardations of 2 g under the maximum weight conditions. Various types of installation were illustrated, but it was impossible to put them in any order of preference, though it was generally true to say that the hook suspension for tail-wheel aircraft should be as far aft as possible.

### Hook Design

There were two forms of installation. The first, referred to as A- or V-frame, was restrained to swing in the vertical plane only. Side loads were either taken through the frame or transferred directly to the fuselage if a snap gear was used. The second form embodied a single shaft free to swing sideways as well as vertically, and to align itself with the forces exerted by the arrester wire. It varied in detail and to keep the suspension point as far aft as possible might introduce forward stowing, telescopic stowing or complete, or partial, retraction.

In general the layout of British and American under-deck arrester equipment was the same, but the methods of developing the resistance differed. The main problem in the design of this equipment was to cater for the wide range of aircraft weights and speeds. The British method had the advantage, from the airframe aspect, that practically the full stroke of the gear was used whatever the engaging speed.

Mr. Boddington went on to discuss in some detail arrester gear performance, the mechanics of pick-up, aircraft motion, hook bounce, hook design, barrier operation and requirements, and barrier engagement. The barrier, he said, divided the flight deck into two parts and was designed to arrest an aircraft which had failed to engage the wires. The operation of the barrier in the normal landing cycle was as follows:—

(a) Aircraft lands-on, barrier up.
(b) Barrier down immediately aircraft engages an arrester wire.
(c) Aircraft arrested, released and moves forward to the forward park or to be struck down.
(d) Barrier up, aircraft signalled on.
(e) Aircraft lands-on, and so on.

Barriers were designed to receive aircraft at entry speeds of up to 40 knots, and present-day American equipment catered for speeds up to 60 knots with a pay-out up to 100ft. The British barrier had a considerable advantage over the American in that resistance was offered immediately on engagement. Little information was available on the performance of the safety barrier, but retardations up to 10 g had been recorded.

Concluding his Paper, Mr. Boddington said that it was his opinion that the operation of aircraft from carrier decks could be turned into an advantage over land-based aircraft.

*(Report of discussion will be published next week)*

**FORTHCOMING EVENTS**

May 16th to 19th.—Royal Netherlands Aero Club. Aerial rally at Ypenburg, The Hague.
May 16th to 24th.—Coupe Montana for jet propelled aircraft.
May 17th.—Air League of British Empire: Display at Whitchurch airfield, Bristol.
May 17th.—Wolverhampton Aero Club: At Home.
May 18th.—Southern Area Model Flying Championship. A.S.T. airfield, Hamble, Hants, 2 p.m.—6 p.m.
May 20th.—R.Ae.S. (Graduates and Students): "Operation of Civil Aircraft in the Tropics," Capt. G. U. Allen.
May 24th.—Cannes Air Rally.
May 24th and 26th.—Isle of Man Air Races. Ronaldsway Airport.
May 29th.—Royal Aeronautical Soc.: Thirty-fifth Wilbur Wright Memorial Lecture "The Development of All-wing Aircraft." To be read by J. K. Northrop.

D

# DEVELOPMENT OF THE GOBLIN ENGINE

## *Extracts from a Lecture by E. S. Moult, B.Sc., M.I.Mech.E., A.F.R.Ae.S.*

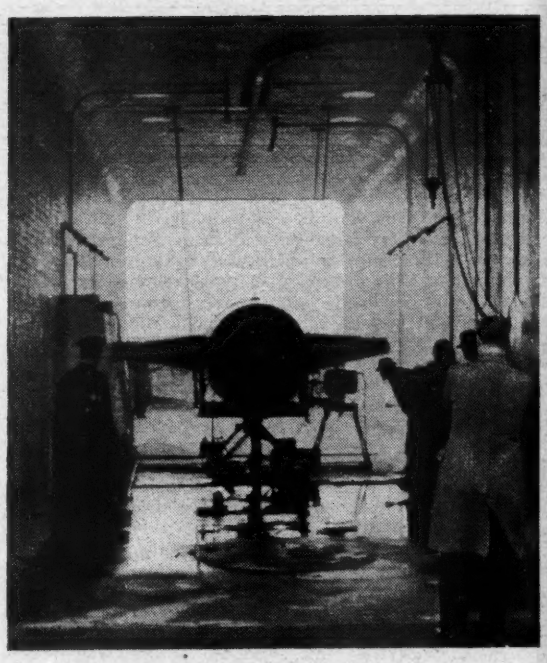
IN his paper under the above title, read before the R.Ae.S. at the Institute of Civil Engineers on May 8th, Mr. E. S. Moult, chief engineer of the de Havilland Engine Company, Ltd., brought to light many new and instructive facts concerning the design, snags, modification and testing of the Goblin gas turbine. Extracts from the lecture, which follow, give some indication of the work required to make the Goblin the successful unit it is to-day.

Mr. Moult began by mentioning the initial study, in 1941, of all available information on gas turbines, and the early discussions which took place to decide on the size and layout of the projected Goblin. He next continued with a concise description of the current Goblin II and then, under the heading "Stages in Development," continued: "The first drawings of the Goblin engine were issued to the shops in August, 1941, and 248 days later the prototype engine ran on the test-bed in April, 1942.

"Initial troubles were associated with starting, buckling of the tail pipe and shortage of capacity of the fuel pump. By devious means these shortcomings were temporarily overcome, and the Goblin engine was run-up to full speed for the first time on June 13th, 1942. Results were most encouraging, but it took a further 2½ years of hard work before reliability in the form of type approval at a comparable rating was established."

### Flying Test-bed Needed

Mr. Moult explained that at this time the firm's commitments on the aircraft side were exceptionally heavy. An airframe was sought in which flight experience with the Goblin engine might be obtained, and a visit was paid to the Gloster Company to consider the adaptability of their new F. 9/40 project. He then told how Mr. Carter (Gloster's chief designer) had suggested turning the engine through 90 deg so that the bifurcated intakes passed neatly above and below his wing spar. "As far as the engine was concerned, this proposal involved some re-organization of the lubrication system and the disposition of the oil sump, but was otherwise straightforward."



**The prototype Goblin gas turbine making its first test-bed run in April, 1942.**

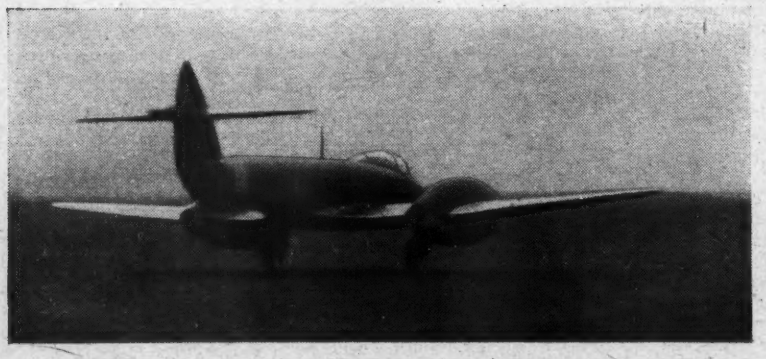
Subsequently, the F. 9/40, prototype of the Meteor, first flew with Goblin engines on March 3rd, 1943. For these initial flights the Goblins were rated at 2,000 lb thrust. The power required to start the engine had been underestimated and so the first engines flew with two starter motors. Much work had to be done on the fuel system before satisfactory starts were obtained automatically.

"At the time of the first flight something like 200 hours of bench testing had been completed, following experience in the air and on the test-bed. By the time the first Vampire flew in September, 1943, the maximum r.p.m. had been raised from 9,000 to 9,500 r.p.m. and the thrust increased to 2,300 lb.

"This progress excited a good deal of interest in America, and a jet-propelled fighter incorporating the Goblin engine was designed and built in record time by the Lockheed Co. The aircraft was known as the XP. 80, and subsequently became the 'Shooting Star.'

"The pressure of bench and flight development was exceedingly heavy at that stage, and it was with the greatest difficulty that development engines were made available to meet the U.S.A. demand. A special dispensation of the wartime restriction was obtained to enable a lorry with lights ablaze to proceed to Scotland, whence the Goblin—complete with de Havilland engineer — was flown direct to California.

"Apart from the mishap (Mr. Moult referred to the collapse of intake ducts on the first unit sent out), the long extension pipe of the XP. 80, combined with the hot climate of California, provided a piece of information which was to be very useful later on. The engine ran considerably hotter than in England, and the temperature distribution of the static blades was by no means ideal. The observed 'hot-spots' were corrected by adjustments in burner flows and led to an investigation which later disclosed a slight air bias from the twin intakes.

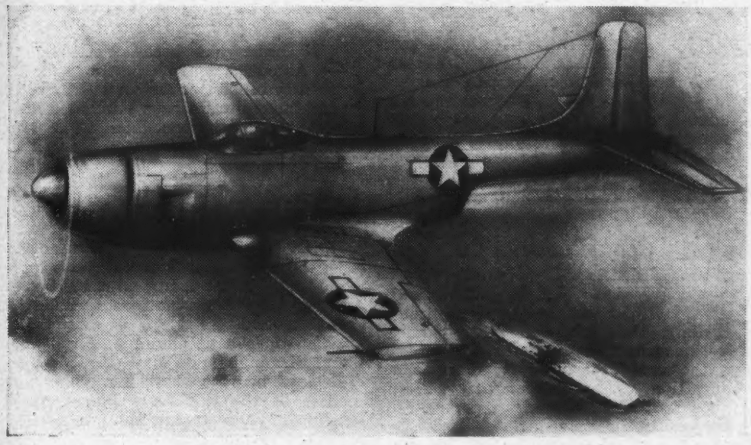


**The F9/40 prototype of the Gloster Meteor first flew in March, 1943, and had Goblin engines. Michael Daunt made the dawn take-off from Cranwell.**

"About this time, the U.S. Navy became interested in the Goblin engine for a long-range naval fighter project. The proposal was to adopt dual power plants by using an air-cooled piston engine driving a propeller for normal operation and augmenting this by a jet unit for combat. A Grumman fighter was converted for experimental purposes, and many useful data were obtained on the problem of relighting in the air. Manufacturing arrangements were placed in the hands of Messrs. Allis-Chalmers. Some engines were built and flown, but the project was closed-down at the end of the Japanese war.

"Arrangements for production were in hand, and in January, 1945, the first Type Test Certificate for a gas turbine engine was awarded to the Goblin I at 2,700 lb of thrust. Meanwhile, the selected development engine had completed between 500 and 600 hours' running at this rating. The next objective was to clear the engine for 3,000 lb of thrust and so, at last, to achieve the design figures with reliability on production-built engines. The official type test at this rating was conducted during July, 1945, and the engine became known as the Goblin II. Something like 3,600 hours of development had been completed at this time.

"The take-off characteristics of the Vampire were so good with 3,000 lb thrust, that modifications were made for trials on an aircraft carrier. Fitted with an arrester hook and additional airbrakes, a jet aircraft first landed-on and took-off from a ship at sea on December 3rd, 1945."



An impression of a Curtiss-Wright XF-15c with piston engine in the nose and Allis-Chalmers-built Goblin exhausting under the tail.

Turning to details of design and manufacture, Mr. Moult said: "During the course of the development of the engine, the compressor has remained fundamentally unchanged. It has the same intake shape, the same size of impellor, the same number of impellor and diffuser vanes as when it was designed six years ago. There have been improvements in material and small changes in blade form.

"The manufacture of the first impellors was a major undertaking and they were, in fact, machined from solid 'cheeses.' These 'cheeses,' which weighed about 500 lb, were the largest forgings that had been made in R.R. 59 at that time, and some concession had to be given on the properties at the centre. The finished weight of an impellor is 109 lb.

"In the course of development, some impellor failures occurred and, on the advice of High Duty Alloys, a change was made in the alloy whereby the silicon content was controlled to less than 0.25 per cent. The minimum acceptance properties at any point in the impellor are as follows:—

| | |
|---|---|
| Ultimate strength | 24 tons/sq in |
| 0.1 per cent proof strength | 16 tons/sq in |
| Elongation | 6 per cent |

"Considerable importance has been attached throughout to the elongation value as denoting some measure of the ability of the material to relieve itself of internal stresses set up in manufacture and to adjust itself to local stress concentrations at bolt-holes, fillets, etc. With low-silicon alloy impellors produced from continuously cast ingots, these minimum properties were handsomely exceeded.

"Every impellor is given an overspeed test as a check on soundness. The plant used consists of a vacuum chamber containing the impellor which, after evacuation of the chamber, can be run-up by a motor car engine to a speed 15 or 20 per cent in excess of the maximum engine speed.

"More recently a special study has been made of vibratory stresses in the impellor under operating conditions. It has been found that the blades respond to two main exciting frequencies. The first of these occurs at four times engine speed and is associated with the intake arrangements; the second occurs sixteen times per revolution and is an impulse arising from the shock of the air leaving the impellor and entering the sixteen diffuser passages.

"One result of this special vibration study has been a modification to the impellor which has moved the 4th order excitation outside the running range. By chamfering back the leading edges of the entry portions of the impellor blades, the fundamental flapping frequency has been raised, and an unexpected advantage was obtained. The modified engine gave increased thrust and a lower operating temperature. This advance is ascribed to an improvement in the Mach number at the outer portion of the entry vanes similar to the effects of 'sweep-back' in the wings of an aircraft. Since compressibility effects become more serious as speed rises and altitude increases, this discovery may be of considerable help in maintaining overall engine performance for altitude flight.

### Turbine Materials

Concerning turbine development, Mr. Moult said:

"With one important exception, the development of the turbine has been largely a matter of metallurgy. After the first four experimental engines had been built, the chord of the rotating blades was increased by 30 per cent and their number decreased proportionately. The object of this change was to strengthen the blades by thickening them—particularly at the roots. As a result, the gas bending stress at full duty was reduced from 6.6 tons/sq in to 2.8 tons/sq in and the natural frequency of vibration was raised. Aerodynamically, the blades were similar to the original narrow-chord type.

Turning to the metallurgical aspects, the lecturer discussed the properties of austenitic and ferritic discs and stated that the minimum properties required from the disc at room temperature were:—

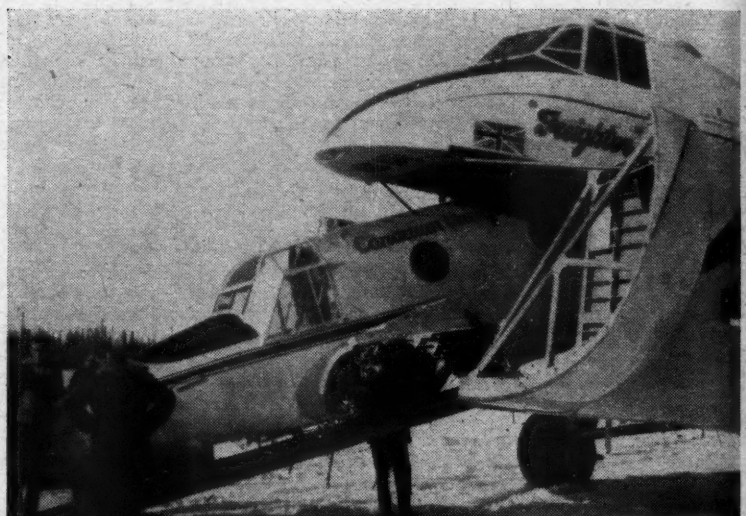
| | |
|---|---|
| Ultimate tensile strength | 55 tons/sq in |
| 0.1 per cent proof strength | 40 tons/sq in |
| Elongation | 15 per cent minimum |

"Before an engine ran," said Mr. Moult, "something like 90 modifications had been made to combustion chambers in the space of nine weeks' testing on a rig, and research and development has been continuous ever since. The total number of chambers has remained at sixteen, and the length available between compressor outlet and turbine inlet has been kept constant; almost every other factor has changed at one time or another.

(*The discussion is reported on page 450.*)

[*Descriptions with cut-away drawings of the Series II Goblin and of a de Havilland gas turbine test house were given in* Flight *of February 21st and June 27th, 1946, respectively. The special tests under extreme climatic conditions to which Mr. Moult referred took place at Munich and some details appeared in* Flight *dated May 2nd, 1946.*]

# HERE AND THERE



**CANNIBALISM : G-AGVC, the Bristol Freighter, which early this year completed a 41,000-mile tour of the Americas, "swallows" a damaged Anson at Baie Comeau, Quebec. The Freighter is in charter service with Canadian Pacific Airlines Ltd., carrying mining equipment to the Labrador interior.**

## For Turkey

IN conjunction with the de Havilland Company, the Fairey Aviation Co., Ltd., have recently undertaken a contract for the conversion of Mosquito aircraft destined for Turkey. The first batches of these aircraft have now been completed, and British Aviation Services have ferried them to Turkey. The modifications included tropicalization.

## Jets for Holland

ACCORDING to the Dutch paper *Het Parool*, Dutch military pilots will arrive in Britain this year to learn to fly jet-propelled aircraft. The Dutch Air Force is to be strengthened by the addition of British jet aircraft, and *Het Parool* adds that Holland is interested in the Gloster Meteor Mk IV and the de Havilland Vampire. No decision regarding purchase has been reached. The Meteor IV was demonstrated over Valkenburg airfield, near Leiden, recently.

## Models at Gravesend

THE S.M.A.E. British Nationals competition will be held at Gravesend Airport on Whit Sunday and Monday, May 25th and 26th. Programmes containing contest rules and information regarding travelling facilities, etc., may be obtained, priced 7½d post free, from the Competition Committee Secretary, H. R. Turner, 61, Avenell Road, Highbury, London.

## Constellations Plus

CONSTELLATION aircraft to be delivered to K.L.M. will now be fitted with Speedpak external freight carriers, thus increasing their payload by 8,000 lb. These aircraft will be used in the main for heavy duty, high payload operation. It is claimed that performance is reduced by only 3 per cent by the addition of Speedpak.

**Eastward Ho ! S/L R. A. B. Learoyd, V.C., seated in the cockpit of his Gemini, talking with Mr. A. F. W. Andren immediately before their departure for Singapore. S/L Learoyd is expecting to complete the journey in 15 days. (See also page 451).**

## Bound for Rio

AN order has been placed by the Argentine Government for a quantity of Gloster Meteor IVs. Six aircraft have already been purchased direct from the production lines at Moreton Valence and one has already been packed for shipment.

## Air Travel at B.I.F.

THE advantages of air transport to business men and industrialists is the theme of the combined exhibit of the three air Corporations, B.O.A.C., B.E.A. and B.S.A.A., at the B.I.F., which opened at Olympia, Earls Court and Birmingham on May 5th. Maps and displays help to show how closely the cities of the world are linked by air services. A feature is also made of the ideal types of freight for air transport and also of modern methods of packing goods to be despatched by air.

## Competitive Spirit

A COMPETITION to encourage the design of light aircraft is being sponsored by French aviation authorities. The winning design of a 75 h.p. 2-seater enclosed cabin machine, with a minimum range of 300 miles, will receive five million francs, as also will the engine manufacturer. The prototype along with production and licence rights are to be acquired by the State.

## Praise for British Jets

BRITISH jet aircraft have been praised in Washington by Mr. Juan Trippe, president of Pan American Airways. Speaking to the House of Representatives Commerce Committee, he said that British jet transports are years ahead of American types, and continued: "The United States faces serious competition from these British jet-engined commercial aircraft, which are produced on labour scales less than half of the comparable American scales." Mr. Trippe named Russia as the most threatening potential air rival to U.S. overseas air lines.

# HERE AND THERE

## Canadian Survey

A SURVEY to cover an estimated 700,000 sq. miles of Canadian territory has begun, with three of the ten air detachments which will be engaged on the survey already operating. 3,000 sq. miles of territory have been photographed so far.

## Percival Prentice Under Licence

THE Hindustan Aircraft Co., which has not hitherto manufactured completed aircraft, is to produce training machines under an agreement with the Indian Government. The type of aircraft to be manufactured under licence from the Percival Aircraft Co. will be Percival Prentice trainers. Indian representatives are at present visiting the Percival works at Luton. Twenty Prentice trainers are to be shipped to India for assembly there before main production starts.

## Aeronautical Congress

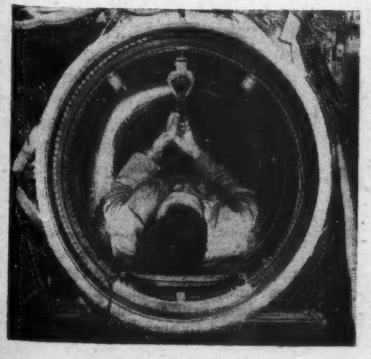
THE Royal Aeronautical Society, in co-operation with the Institute of the Aeronautical Sciences of America, is arranging an Aeronautical Congress to be held in London from September 3rd-6th this year. A tentative programme of some twenty papers to be read, covering a large range of subjects, has been arranged.

## Birthday

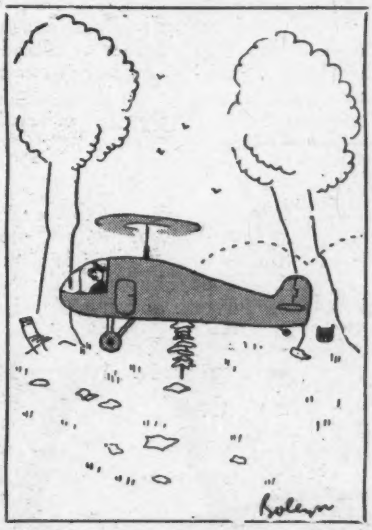
CELEBRATING its first year of trans-atlantic air operations on May 3rd, Panair do Brazil, affiliate of Pan American Airways, has made 229 Atlantic crossings. Panair do Brazil operates a weekly service from Rio de Janeiro to London via Recife, Dakar, Lisbon and Paris.

## Yo-Ho-Heave!

A NEW and somewhat unorthodox method of inter-compartment communication is provided in the U.S.A.A.F. XB-36. Shown in our picture is the subway built in the XB-36 with a crew member lying on the four-wheel "scooter" pulling on an overhead cable to propel himself through the tunnel. Like the rest of the aircraft, the tunnel is pressurized and measures 2ft in diameter and 85ft in length, and is the only means of getting from the forward to the aft cabin whilst the machine is in flight. A civil version of the XB-36 is being developed.



**SMOOTH AMBASSADOR: This photograph illustrates the clean lines of the Centaurus power plants installed in the prototype Airspeed Ambassador. Ducts for the injector carburettor and oil cooler are inside the cowling. The vent seen beneath the power plant is a temporary oil-cooler outlet.**



## Helicopter Taxi

THE increasing popularity of helicopter aircraft shows itself again in an announcement that the British Electrical Traction Co., Ltd., is examining the possibilities of helicopters for air charter work. Mr. Norman Hill, who was manager of the aircraft division of Tecalemit, Ltd., has been appointed air adviser to the scheme.

## Easier Connections

A NEW thrice-weekly K.L.M. service linking Amsterdam, Geneva and Rome will start on June 9th. Travellers from Italy now have a connection choice of three K.L.M. transatlantic Constellations each week. In the opposite direction, from New York, there will be an immediate connection at Amsterdam for passengers continuing to Rome.

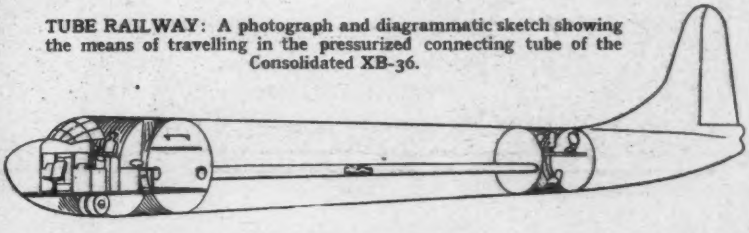
## Challenge to A.T.A.

AMERICAN sources aver that the women's international speed record has been broken by Marjie Hurlburt, a school teacher, of Painesville, Ohio. Flying at 337.635 m.p.h., her time checked by N.A.A. was over 45 m.p.h. better than the old record of 292.271 m.p.h. set by Jaqueline Cochran in 1937. The record speed was taken over a three-kilometre course and determined on an average of the four best laps.

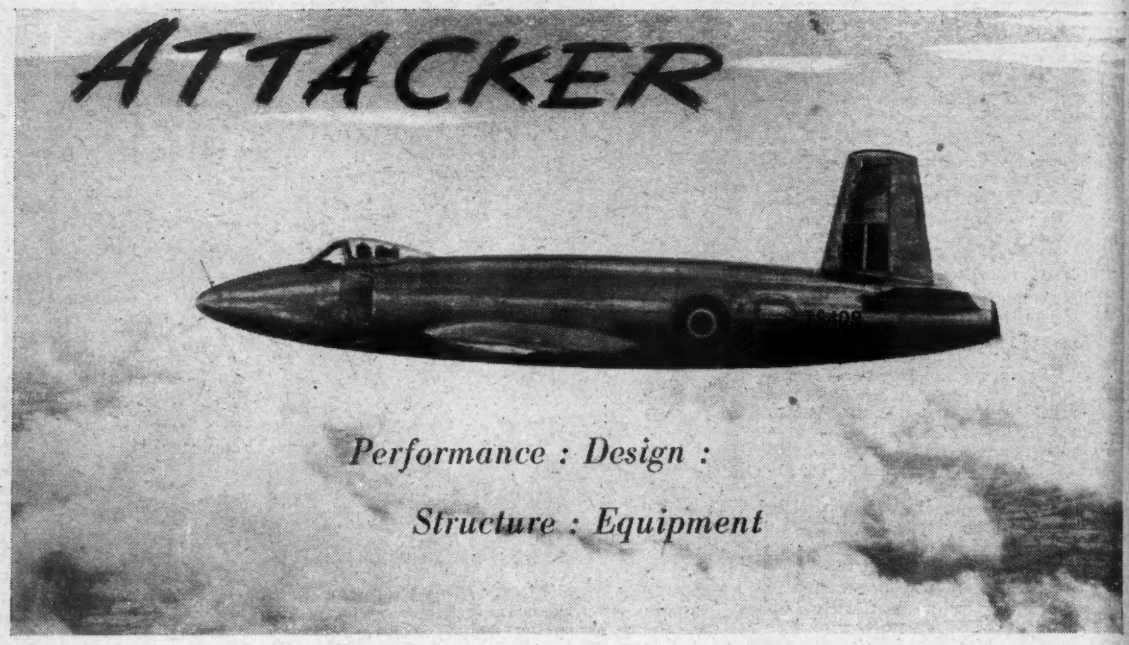
## 1,000 m.p.h. Jets?

AIR COMMODORE FRANK WHITTLE, on his first visit to Canada, told a Press conference in Toronto that air speeds of 1,000 m.p.h. are possible "in the not too distant future." He predicted London to Montreal Atlantic crossings in five hours, and added that Britain might outdistance the United States in overseas transport if the quality of her engine designs were maintained.

**TUBE RAILWAY: A photograph and diagrammatic sketch showing the means of travelling in the pressurized connecting tube of the Consolidated XB-36.**



# ATTACKER



## *Performance : Design : Structure : Equipment*

NO single-jet fighter yet flying, be it British or foreign, holds more promise of development than the Vickers-Supermarine Attacker, and none exceeds it in performance. This is remarkable, because Air Ministry Specification E.10/44, to which the machine was constructed, was a wartime expedient, intended to provide without delay a fighter which could derive full benefit from the 5,000 lb thrust offered by the Rolls-Royce Nene.

To the terms of the specification may be ascribed the wing and undercarriage. Basically those of the Spiteful XIV (Supermarine Type 371) these features, far from penalizing the Attacker (Type 392), have proved of decided advantage. Having enabled the Spiteful to achieve over 480 m.p.h. in level flight, the beautifully constructed laminar-flow wing, in conjunction with an equally well-finished fuselage, has allowed the new jet fighter to exceed this speed by more than 100 m.p.h., while the tailwheel undercarriage, appreciably lighter than the equivalent tricycle, has promoted none of the dire consequences (serious scorching of grass and disruption of runways) frequently predicted in the early days.

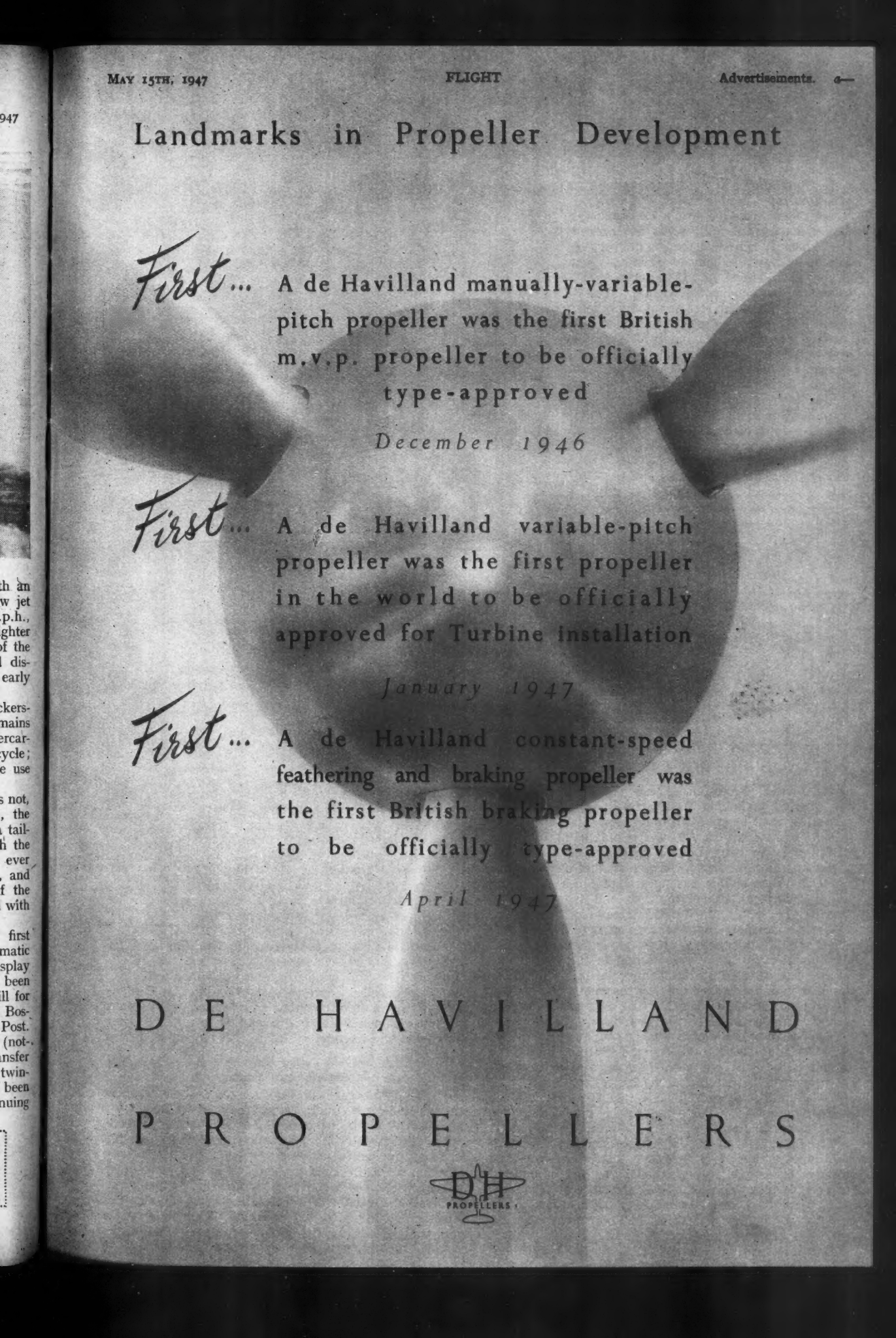
Mr. J. Smith, C.B.E., chief designer to Vickers-Supermarine, is certainly no reactionary and remains quite unprejudiced in his views concerning undercarriages, fully admitting the peculiar merits of the tricycle; but he is emphatic that tests have vindicated the use of conventional gear.

As a matter of historical accuracy, the Attacker is not, as is frequently asserted, the first jet aircraft to have a tailwheel undercarriage, both the He 178, the first aircraft ever to fly with a turbine jet, and the original prototype of the Me 262 having been fitted with this type of gear.

Since "TS409," the first Attacker, made its dramatic debut at the S.B.A.C. display last September, it has been flown by Mr. Jeffery Quill for about thirty hours, from Boscombe Down and High Post. Various improvements (notably an automatic fuel-transfer system and twin-axle, twin-tyre tailwheel) having been embodied, it is now continuing

**The control column has been pulled back to show how various indicators and switches have been grouped round the blind-flying panel.**

# Landmarks in Propeller Development



*First...* A de Havilland manually-variable-pitch propeller was the first British m.v.p. propeller to be officially type-approved

*December 1946*

*First...* A de Havilland variable-pitch propeller was the first propeller in the world to be officially approved for Turbine installation

*January 1947*

*First...* A de Havilland constant-speed feathering and braking propeller was the first British braking propeller to be officially type-approved

*April 1947*

DE HAVILLAND

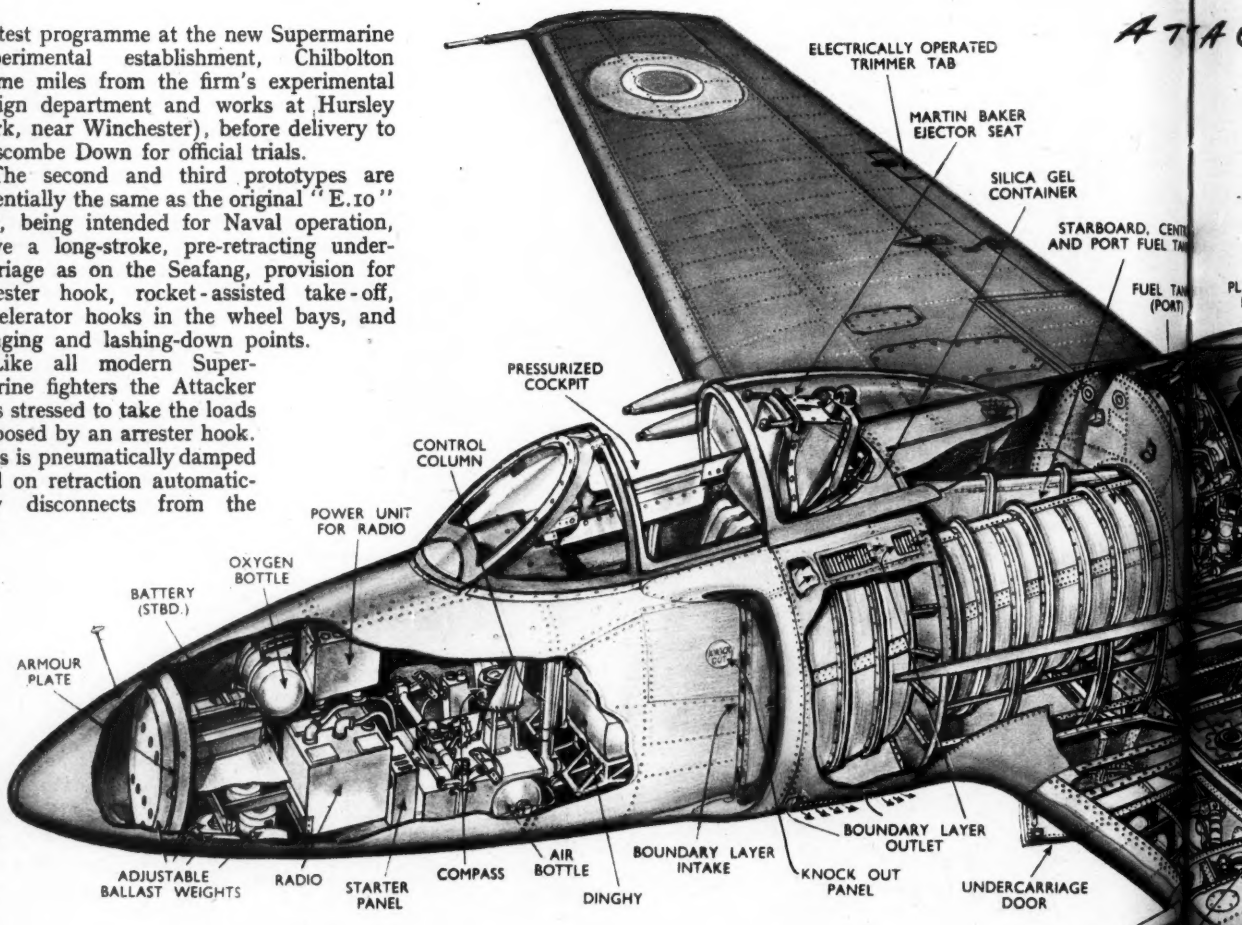
PROPELLERS

DH PROPELLERS

its test programme at the new Supermarine experimental establishment, Chilbolton (some miles from the firm's experimental design department and works at Hursley Park, near Winchester), before delivery to Boscombe Down for official trials.

The second and third prototypes are essentially the same as the original "E.10" but, being intended for Naval operation, have a long-stroke, pre-retracting undercarriage as on the Seafang, provision for arrester hook, rocket-assisted take-off, accelerator hooks in the wheel bays, and slinging and lashing-down points.

Like all modern Supermarine fighters the Attacker was stressed to take the loads imposed by an arrester hook. This is pneumatically damped and on retraction automatically disconnects from the arrester wire. Prototypes 2 and 3 differ further from the original in having the Martin-Baker ejector seat, instead of the Vickers-Armstrongs type.




Aerodynamically the Attacker is notable not only for its laminar-flow wing, but for the design of its fuselage—perhaps more perfect in form than that of any other fighter. Whereas this has no straight lines, the wing and tail surfaces, except for their end caps, have no curves. In section the fuselage reproduces something of the laminar-flow characteristics of the wing, though the maximum thickness is at 50, and not 40, per cent. A comparatively large cross section in this region was in any case dictated by the diameter of the Nene. The fuselage lines are broken only by the pilot's enclosure—in itself exceptionally clean, having a faired windscreen—and by the segmental air intakes flanking the cockpit.

The design of the intakes was, of course, very critical, and bleeds are used to tap off the "tired" air of the boundary layer. Tests with these faired-over resulted, as predicted, in reduced performance and thrust.

Structurally, the aircraft is distinguished for its finish and strength, heavy-gauge material having been applied in an exemplary manner.

The fuselage is mainly of aluminium-alloy, stressed-skin construction, with 24 closely spaced stringers and formers of channel section, though the nose is unusual in being a true "lobster claw" structure of laminated aluminium-alloy sheet, as much as 0.56in thick at the top and bottom, and having no stiffening members. This serves as armour protection for the pilot and is amenable to pressurizing. A detachable tip is provided for the cine camera-gun and for ballast stowage, and behind this is a transverse sheet of armour plate.

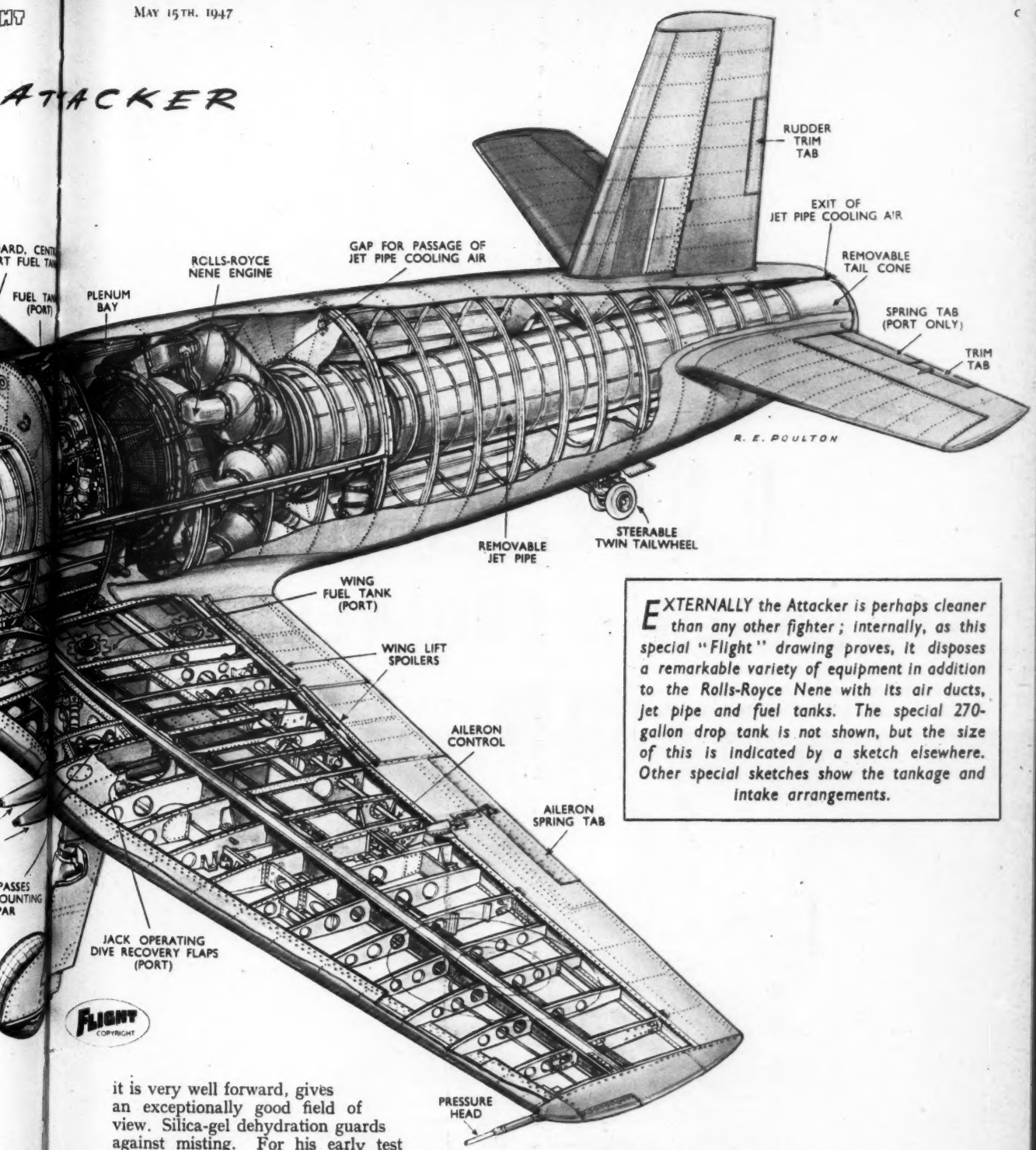
There follows the main nose section (at present housing automatic observer equipment in addition to the accumulators, oxygen bottle, radio and engine-starting panel) and the cockpit proper, with its cordite-operated ejector seat, jettisonable sliding canopy, and provision for a g-suit. Aft of the armour plate in the tip of the nose the whole of the forward portion of the fuselage, which, due to the configuration of the intake ducts, is virtually a self-contained nacelle, is pressurized to a differential of 3½ lb/sq in by air from the blower casing, controlled by a Normalair constant-flow valve and slave unit. Air for the engine-bay pneumatic seal is also tapped from this supply.

### Emergency Exits

At the entrances to the engine air scoops are two emergency-escape panels, which may be jettisoned by the pilot by operating handles, or by outside helpers knocking-in small circular panels and thus gaining access to the same handles.

For initial flight trials the Perspex fairing forward of the screen has not been fitted, though this feature must obviously be beneficial on an aircraft as fast as the Attacker. It is hoped that eventually double-curvature glass will be used for the complete screen. The whole cockpit enclosure is immensely strong and, located as

# ATTACKER




*EXTERNALLY the Attacker is perhaps cleaner than any other fighter; internally, as this special "Flight" drawing proves, it disposes a remarkable variety of equipment in addition to the Rolls-Royce Nene with its air ducts, jet pipe and fuel tanks. The special 270-gallon drop tank is not shown, but the size of this is indicated by a sketch elsewhere. Other special sketches show the tankage and intake arrangements.*

it is very well forward, gives an exceptionally good field of view. Silica-gel dehydration guards against misting. For his early test flights Mr. Quill has found it an advantage to have a bead sight mounted on the nose of the fuselage as a datum point.

Immediately aft of the cockpit is the semi-monocoque fuel-tank bay, the top cover of which is screwed on, and following this is the pressurized power-plant bay, also with screwed-on cover, housing the Nene and its auxiliary equipment. Here the fuselage attains its maximum diameter before gradually tapering off to the tail.

Flying control leads from the cockpit are taken through a pressure seal, having no sliding joints, into a 14-inch light-alloy duct running fore and aft along the bottom of the fuselage. The controls themselves are conventional, as on the Spiteful, the rudder pedals being of adjustable S.B.A.C. type. Elevators and rudder are cable-controlled, but a system of rods and levers is used for the ailerons. The trim tabs have chain and cable control.

In respect of their main structure the detachable all-metal fin and the two halves of the dihedral tailplane are interchangeable. The dihedral on the tailplane allows an efficient junction with the fuselage, and at the same time raises the effective height of the tailplane relative to the wing. The port elevator has a spring tab

VICKERS-SUPERMARINE

'ATTACKER'

(ROLLS-ROYCE 'NENE')

*FITTED WITH*

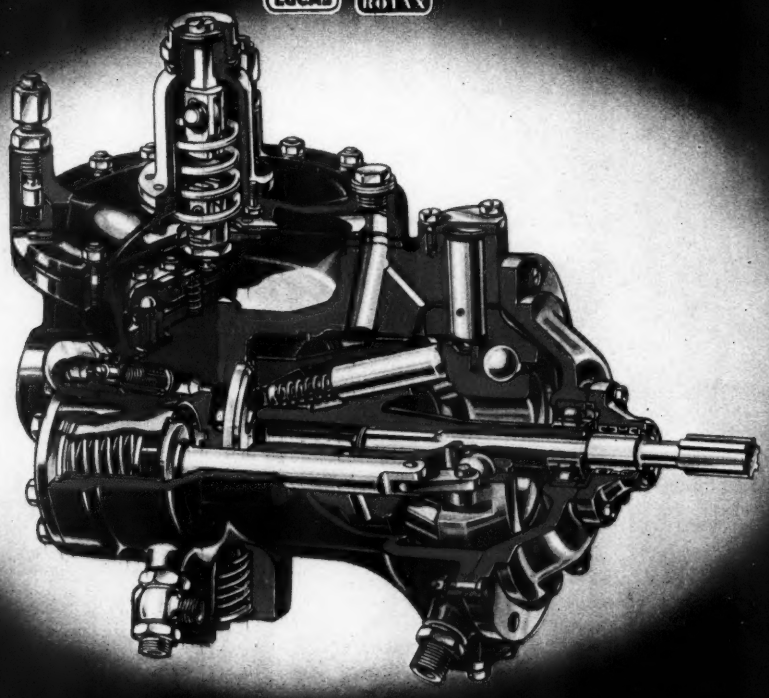
**FUEL & CONTROL SYSTEM**
**COMBUSTION EQUIPMENT**
**STARTING EQUIPMENT**

*DESIGNED & PRODUCED BY*

# LUCAS

## RESEARCH & ENGINEERING

JOSEPH LUCAS LTD · BIRMINGHAM 19 — ROTAX LTD · WILLESDEN · LONDON NW10



*Sectioned View of Patented* **LUCAS** *Fuel Pump.*

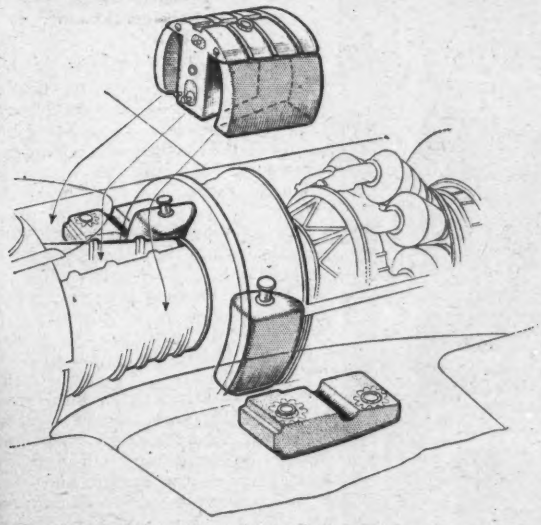
# ATTACKER

located inboard of the trim tab on the trailing edge.

In addition to the standard flying instruments the cockpits of the three Attacker prototypes contain some interesting test gear, including a bridge-type thermometer, an angle recorder for the elevator, and an indicator for the temperature of the structure surrounding the jet tail pipe.

A 24-volt earth-return electrical system is used, power being supplied by an HX2 engine-driven generator cooled by air from the main intakes and charging two series-connected accumulators in the nose of the fuselage. In view of the modern design of the Attacker it may be instructive to note some of the electrical services provided: fuel pumps; fire warning and extinguisher system; temperature indication; oil pressure and temperature; cabin pressure warning; A.S.I. pressure head; lateral trim actuator; indicators for flap position; undercarriage and engine speed indicators; gun firing; and miscellaneous warning lights.

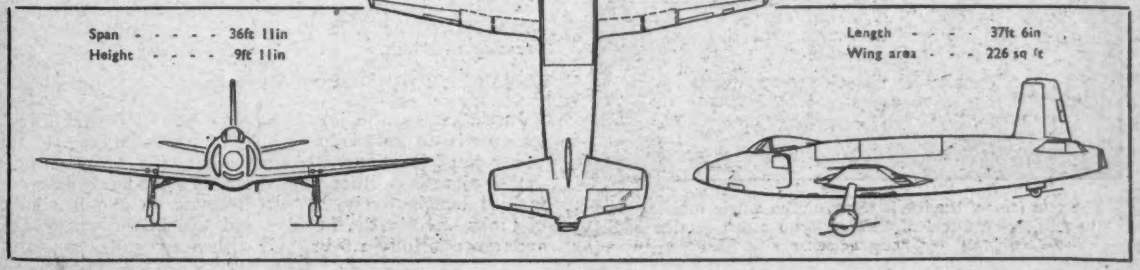
All three Attacker prototypes have V.H.F. radio, pro-

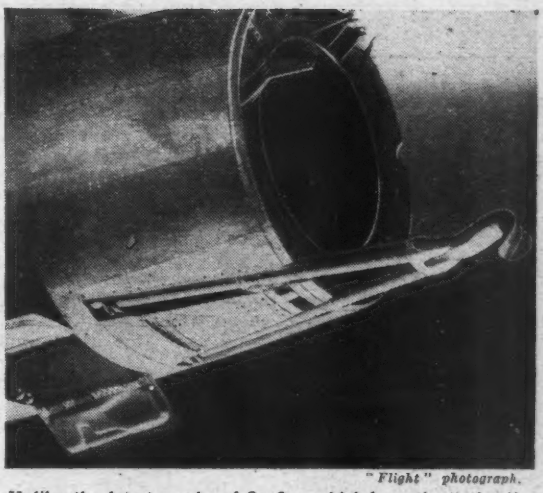


**The Attacker has seven internal fuel tanks, five in the fuselage and two in the wing, as shown.**

vision for I.F.F. and beam-approach equipment, mounted in way of the accumulator access door in the bottom of the nose section. Should the aircraft pass into production, a quickly removable "escalator," bearing the complete radio gear, may be embodied. A mock-up of this feature has already been made.

Basically those of the Spiteful XIV, the mainplanes of the Attacker give a somewhat larger gross area (226 sq ft), because of the wider fuselage, and have a 2½ deg incidence. There is a single main spar and one auxiliary spar, and each main panel, which has a slight increase in taper from a point inboard



*"Flight" photograph.*

**Unlike the latest marks of Seafire, which have the "sting" type arrester hook, the Naval version of the Attacker is fitted with a V-frame type.**

of the gun bay, bolts directly to stub spar booms, there being no centre-section. The flush-riveted skin is very carefully applied to preserve accurately the Supermarine 371-I and II laminar-flow sections. At the root the maximum thickness is at 40 per cent of the chord and at the tip at 42 per cent.

In area the split trailing-edge flaps are slightly greater than those of the Spiteful, and the flaps themselves are stiffer. The slotted ailerons have spring tabs, these having proved to exert a very beneficial effect on manœuvrability, the stick forces being more or less constant. An electrically operated trim tab, with Miles Actuator, is fitted on the starboard aileron, outboard of the spring tab.

On the deck-landing versions are retractable lift spoilers, forward of the flaps. Another Attacker innovation is the fitting, forward of the main spar, outboard of the gun bay, of hydraulically operated rectangular dive-recovery flaps, measuring 20in × 4in and hinged at their forward edge on the under surface of the wing. These lie flush with the skin when retracted, and their position is indicated in the cockpit.

### Undercarriage

The first Attacker has been fitted with a main undercarriage almost identical with that of the Spiteful, but the second and third machines, being intended for deck landing, have the long-stroke Seafang gear, with 9in travel instead of 7in. Pre-retraction is necessary with this design in order to house the main wheels in the standard recesses.

As clearance between the jet tail pipe and the bottom skin of the fuselage is comparatively small, it has been necessary to use twin tailwheels. These now have individual axles to give a better differential action in steering. For take-off and landing the tailwheel assembly is locked, but can caster through 360 deg for manœuvring.

# ATTACKER

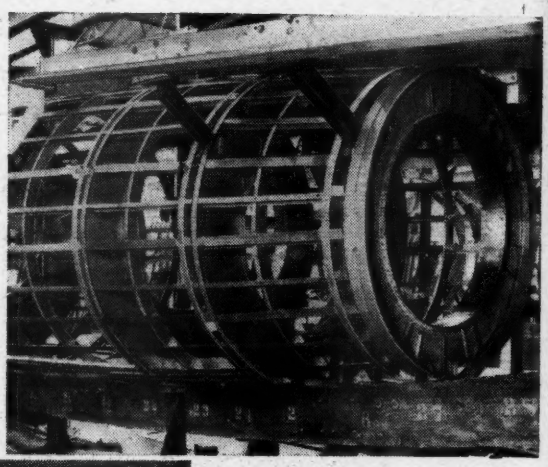
Retraction and lowering of the undercarriage is effected hydraulically, and there is a compressed carbon dioxide system for emergency lowering. The oleo-pneumatic struts are of Vickers manufacture, and the pneumatic brakes are Dunlops. A Vickers hydraulic reservoir is used in conjunction with an engine-driven pump, a Turner hand pump and a Vokes filter.

In considering the power plant installation it should be appreciated that the Attacker was designed round the most powerful turbine jet unit in the world—the Rolls-Royce Nene I, with a static thrust of 5,000 lb. In an ideal installation, from the standpoint of engine performance, though not necessarily of aerodynamic efficiency, the Nene would perhaps be fed by a single direct intake, but that the carefully designed twin scoops of the Attacker, with their ample area, gradually converging ducts of diverging form, and boundary-layer bleeds, give high efficiency is not to be doubted after perusal of the performance data on page 449.

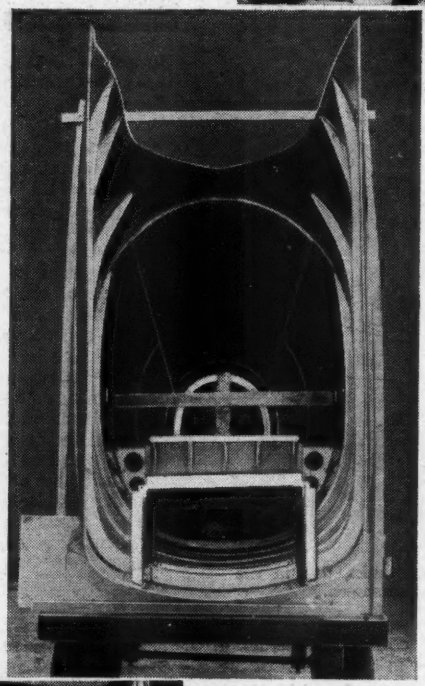
Free of the impediment of the boundary layer (extracted through louvres on the top and bottom of the fuselage) the intake air enters two ducts, similar in section to the scoops, which converge at the front of the engine bay. The entry to this bay, or plenum chamber, which is sealed to hold 6½ lb/sq in, has been the subject of special study in order to ensure smooth passage of the air to the rear impeller face.

Supporting the Nene on the heavy box-section rear spar frame are two trunnions, and bracing it fore and aft to the main spar, a front mounting strut. Two "crash struts" restrain it from shifting towards the cockpit in the event of a crash landing. The auxiliary gear box is located forward of, and above, the engine.

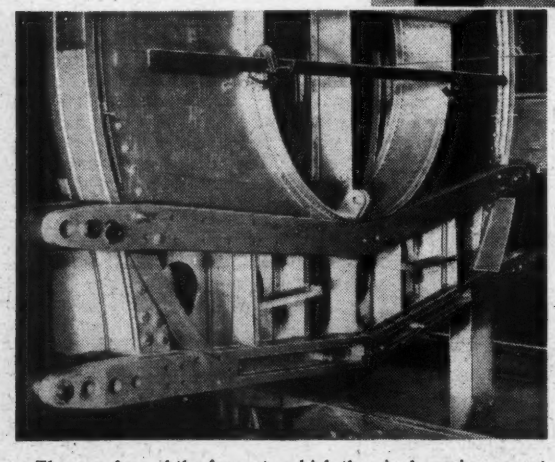
It will be appreciated that when the Nene is started, a depression tends to form in the power-plant bay. To prevent the engine from starving, and the walls of the bay from buckling, spring-loaded ground-running louvres are let into the fuselage skin surrounding the intake; thus, when the engine-bay pressure has built up to atmospheric (a speed of 90 m.p.h. is sufficient to create the necessary ram pressure) these close automatically and the bay is completely sealed.



The rear section of the Attacker's fuselage before skinning.



(Right) The nose portion of the Attacker's fuselage is a "lobster claw" of laminated sheet.



The rear face of the frame to which the single main spar of the Attacker is attached. There is no centre-section in the accepted sense.

With a long jet pipe as used on the Attacker it is necessary to provide an exhaust-cone bleed volute, valve and outlet. The valve is manually operated during starting—particularly with weak starter batteries — and guards against resonance effects which may be built up, affecting the efficiency of the turbine and causing excessive jet pipe temperatures.

The tail pipe, of Firth-Vickers F.D.P. sheet, is installed with the aid of a special jig and is supported by swinging links in such a manner that 1¼in expansion is allowed. This pipe is centred by screw adjustments, and where the propelling nozzle emerges from the tail fairing there is a ⅜in clearance for the jet-pipe cooling air. In side elevation the nozzle is asymmetrical, the plane of the orifice being raked at 10 deg so that a down thrust of 200 lb acts on its lower lip, ensuring that the aircraft shall not nose over during full-thrust ground running.

Aft of the expansion chambers of the engine is the distributor ring for the fire-extinguisher system, fed by a bottle on the forward side of the cockpit bulkhead. In the engine bay are two flame switches—port and starboard—which, in the event of fire, are closed by the detonation of explosive heads, causing a lamp to glow in the cockpit and warning the pilot to operate the extinguisher by pressing a switch.

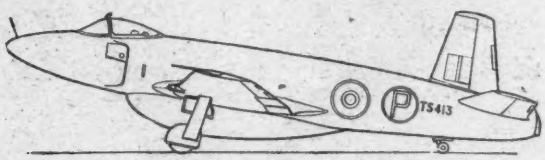
## Fuel System

In the design of a jet fighter provision of adequate fuel tankage is an especially trying problem, and, due to its power-plant location and duct layout, the Attacker presented more difficulties than most. These, however, were tackled imaginatively, and by recourse to a multiplicity of tanks—five in the fuselage and two in the wings—the endurance is fully 1.6 hr, and with a 270 gall. drop tank

can be extended to 3.78 hr. An endurance of this order extends the usefulness of the Attacker far beyond the local-defence intercepter field and will be particularly appreciated when the machine is operated from an aircraft carrier.

Forward of the engine compartment is the main tank bay containing a central, rigid, 76 gall tank of Vickers-Supermarine design and manufacture. The unusual configuration of this tank, resulting from its location between the converging air ducts, may best be appreciated by referring to the sketch on page 447. Welded Birmabright BB3 is the constructional material.

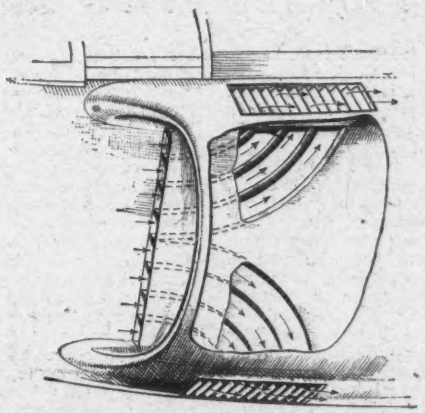
Two "Marflex" bag-type pannier tanks, each holding as much as the centre tank, are shaped to conform to the curvature of the air ducts and fuselage. Aft of the tank bay, forward of the power plant, are two further tanks holding 12 gall each, and, displacing the coolant radiators of the Spiteful, are two interspar tanks with a combined capacity of 47 gall.



**A maximum endurance of 2.81 hr. is possible using the special 270-gallon drop tank, the relative size of which is indicated by this sketch.**

As originally flown, the Attacker was not equipped with an automatic fuel-transfer system but all three prototypes now embody a system whereby the kerosene from all subsidiary tanks is automatically and continuously transferred to the main tank, delivery being controlled by a float valve and effected by air tapped from the compressor of the Nene after being reduced to 4½ lb sq/in by a regulator valve. Should this valve stick, a relief valve will prevent damage. The fuel pipes are constructed to ensure an even rate of transfer, irrespective of tank capacity, and the limits of the pilot's responsibility in respect of tankage are observation of the warning light which indicates that transfer is complete, and operation of the drop tank selector.

A Simmons Pacitor gauge is provided for the main tank (the only tank to be gauged), and a Kent flowmeter indicates "gallons gone." With the Nene at full throttle and consuming something like 600 gall of fuel an hour, it may readily be understood that reading of the flowmeter's decimal scale is virtually impossible, so rapidly does the Veeder counter revolve. The increased thrust from the Nene, which is to be expected, will be well within the capacity of the present fuel system, capable as it is of dealing with up to 900 gall an hour.



**A diagrammatic representation of the boundary layer bleed system successfully applied to the air intake system of the Attacker.**

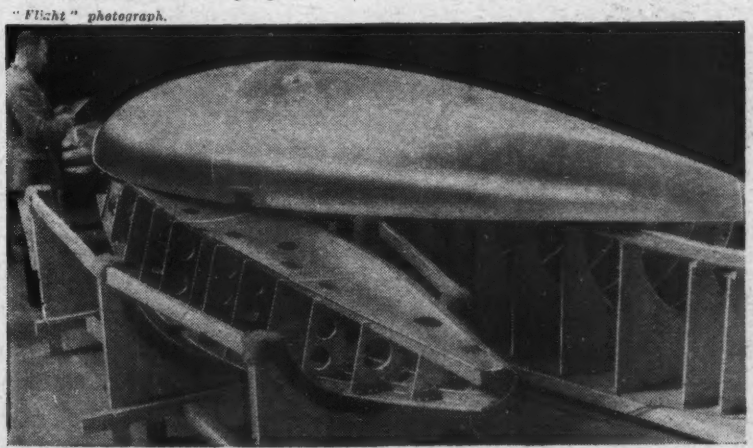
### Fuel Pumps

Fuel feed to the engine is by a low-pressure electric booster pump, a product of the Pulsometer Engineering Co., mounted low in the forward face of the main tank, and for inverted flight, or negative-g conditions, a secondary pump, automatically brought into play by a mercury-vapour switch, is fitted at top rear of the tank. Inward-venting valves operate during sustained dives.

The relative size of the 270 gall drop tank is truly remarkable, and the ground clearance is only a few inches. Supported by a "40,000-lb" bomb slip made by Vickers (Dartford), it embodies a vertical rod on which a nut is tightened to secure the fillet snugly and smoothly against the underside of the fuselage. The tank is one of the largest of its kind yet made and is tested to 24 lb/sq in. It is supplied with four pressure-filling points.

The Attacker carries the full arma-

*"Flight" photograph.*



**A 270-gallon drop tank under construction. Note the subtly shaped fillet, designed to secure a snug fit under the fuselage.**

**VICKERS SUPERMARINE ATTACKER**

**One Rolls-Royce Nene Turbine Jet of 5,000 lb Static Thrust**

DIMENSIONS

| | |
|---|---|
| Span | 36ft 11in |
| Length | 37ft 6in |
| Max height (tail down) | 9ft 11in |
| Wing area | 226 sq ft |

WEIGHT

| | |
|---|---|
| Normal all-up weight | 11,300 lb |

PERFORMANCE (I.C.A.N. Conditions)

*Level Speeds* (combat rating, at 95 per cent normal weight)

| | |
|---|---|
| Sea level | 590 m.p.h. |
| 10,000ft | 583 m.p.h. |
| 20,000ft | 561 m.p.h. |
| 30,000ft | 538 m.p.h. |

*Rate of Climb* (combat rating, at weight of 11,300 lb)

| | |
|---|---|
| Sea level | 6,600 ft/min |
| 10,000ft | 5,600 ft/min |
| 20,000ft | 4,500 ft/min |
| 30,000ft | 3,280 ft/min |

*Time to height* (min)

| | |
|---|---|
| 10,000ft | 1.64 |
| 20,000ft | 3.61 |
| 30,000ft | 6.17 |

*Operational Ceiling* (rate of climb 500 ft/min), 48,500 ft

| *Range at 30,000ft* | *Normal* | *With 270 gal drop tank* |
|---|---|---|
| Average cruising speed | 380 m.p.h. | 392 m.p.h. |
| Miles per gallon | 2.94 | 2.76 |
| Duration of cruise | 1.08 hr | 2.81 hr |
| Total distance | 410 miles | 1,100 miles |
| Maximum endurance | 1.6 hr | 3.78 hr |

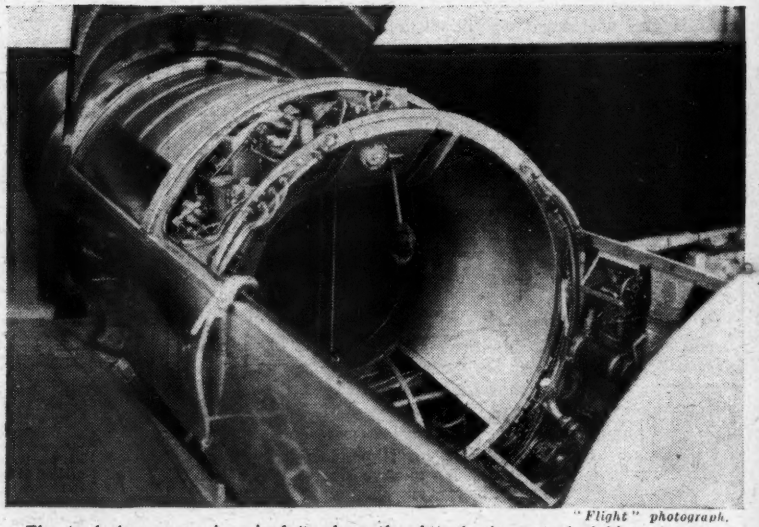
| | |
|---|---|
| Take-off distance to clear 50ft screen in still air | 847 yd |
| Landing distance over 50ft screen at 9,760 lb (including 100 gall of remaining fuel) | 855 yd |

*Note.*—The ranges and endurances quoted above include allowance for two minutes at take-off power, climb to 30,000ft and 15 minutes combat at 30,000ft.

## ATTACKER

ment specified for modern R.A.F. fighters—four 20 mm British Hispano Mk. V guns—wing mounted, as in the Spiteful, and electrically fired by Maxiflux-Star units. In each mainplane are two ammunition boxes, those for the inboard guns being between the gun bay and the fuselage, and those for the outer guns arranged outboard. Each inboard gun has 167 rounds and the outboard guns have 145 rounds apiece.

With an aircraft as fast as the Attacker, somewhat heavy penalties must be paid for carrying external loads, but if these are acceptable the type can be readily adapted to take two 1,000 lb bombs or four 300 lb R/Ps. Comprehensively armoured, and with its good field of view for the pilot and exceptionally high speed near the ground, this new fighter is a formidable low-attack machine.



*"Flight" photograph.*

**The tank bay cover is raised to show the Attacker's central rigid tank and a flexible side tank. In the foreground is the pressurized engine bay, with the latest type of entry fairing. The protruding drive shaft is for the auxiliary gear box.**

# Development of the Goblin Engine

## *The Discussion following Mr. E. S. Moult's Lecture*

IN the absence of Sir Frederick Handley Page until late in the lecture, the chair was taken by Dr. Roxbee Cox who, before declaring the discussion open, said that he hoped that Mr. Moult's lecture, the first to trace the history of a famous engine, might later be followed by a paper from Mr. Bishop on the development of the Vampire.

Opening the discussion Mr. Pilling compared early Metrovick units with the H.1 of 1943, and then asked for information on quick acceleration on the Sea Vampire. Replying, Mr. Moult said that heavy air brakes had been fitted to this Vampire so that more throttle in the region of 7,000 r.p.m. instead of the usual 4,000 to 5,000 r.p.m. could be used on the approach. From idling speed of 3,000 to the maximum of 10,500 r.p.m. took about seven seconds on the Goblin, but 7,000 to 10,500 would only require one to two seconds.

Dr. Roxbee Cox, commenting on the lecture, said that altitude and special test plants would be provided as soon as it was possible. He thought it remarkable there had been so little change in the Goblin since its initial conception, and asked for Mr. Moult's views on thrust-spoilers for baulked landings, adding that they should act in about one second. Mr. Moult said that de Havillands would like to try a thrust-spoiler but so far these were somewhat heavy and not very reliable; they would prefer a "pusher-backer"—a negative thrust device.

The next question concerned manœuvring on the ground, particularly of civil jet aircraft on a congested airport, and the effect of the throttle on units in which the compressor and airscrew had separate turbines. Mr. Moult believed that in general the response of jet motors to the throttle on the ground was good, and that the airscrew-turbine presented less of a problem because the jet was less intense.

Another question concerned the use of the main engine compressor for cabin blowing, and it was remarked that this method seemed to be favoured in America but not by designers in this country. The lecturer in answer said that there was a feeling against the use of the main compressor, partly due to the risk of contamination of the air by oil fumes, and also because the pressure would be dependent upon the blower r.p.m., thus presenting difficulties when the power unit was throttled back.

A question was next asked about the effect of sand in the atmosphere upon a jet unit, and the answer was that it seemed that lots of dust and dirt could enter an engine with surprisingly little damage. Some form of deflector for take-off might be acceptable, but not a filter, due to the loss of ram. W/C. Lees mentioned a recent two-hour test run in which little damage was done by sand in the atmosphere.

An interesting point was raised on the application of the sweep-back principle to supercharger and turbine entries. Mr. Moult repeated his remarks on the bevelling of the leading edge of the entry portions of the impeller blades, the diagonal cut-back at the top, and the subsequently unexpected improvement in performance. Work was in progress on the diffuser entrance and bevelling had been tried to get rid of shock waves which had an adverse effect on combustion. He could at least confirm that the treatment was an advantage in the diffuser.

In answer to a question on the injection of fuel, the lecturer said that atomization was of first importance. A major problem was the great difference of pressures for injection between sea level and high altitude.

Major Halford remarked that aircraft tended to be tail-heavy and to become more so, he therefore thought that thrust-spoilers would not be popular because of their weight until they became part of the first conception. He thought also that America was to be envied for her full-scale test facilities, and believed that development would be handicapped in this country until we had adequate means of testing components.

Mr. Moult was next asked about his company's choice of the single-sided impeller with high-velocity intake, and his views on the advantages of the straight-through as opposed to the reverse-flow design. He said that the ram intake on the Vampire was 90 per cent efficient. The choice of the single-entry compressor had been governed very much by airframe considerations. A small high-velocity intake duct was desired so the air must go straight in. The company had never regretted the single-entry decision, and he believed that the faster and higher we flew the more apparent would be its advantages. Speaking of straight-through flow he said that initially there was some disadvantage because they could not profit by early Whittle experience.

Dr. Watson, who also commented on the question, added that Whittle had chosen the "bent" chamber to allow more room for the air to diffuse properly.

On maintenance and production costs compared with the piston engine, Mr. Moult said that it was a choice of a high rating and a short, gay life, or a lower rating and longer life. The total cost of a high-power piston engine power plant and airscrew would be greater.

Another question was asked regarding the fuel consumption of an engine when given a low rating, and Mr. Moult said that if a low-rated engine could be designed regardless of bulk, one could get a very low specific consumption. Normally the best specific consumption was given at just under maximum power output, but present jet engines gave reasonable fuel consumptions over quite a wide range of thrust.

# CIVIL AVIATION NEWS

*B.S.A.A. Tudor Routes : Manchester's Air Terminus : Civil Aviation in New Zealand*

**GEMINI GEMINOUS : Both aircraft left recently for Singapore. One is to be used by the Governor-General and for flying V.I.P.s, and the other is for use by the Department of Civil Aviation, Singapore.**

## *STOWTING CRASH CONCLUSIONS*

REPORTING on the accident at Stowting on January 11th when a B.O.A.C. Dakota flown by Capt. I. R. Goalen crashed with the loss of eight lives, the Chief Inspector of Accidents makes several recommendations. It will be remembered that the aircraft was on a journey from London to West Africa, with Bordeaux as the first stop

The accident is stated to be due to the following contributory causes: the weather conditions encountered throughout the flight; bad crewing, as a result of which three of the four operational members of the crew were unfamiliar with the route from London to Bordeaux; the captain failing to ensure that he had all the necessary navigational landing aid information for that part of the route, in which respect the navigator could not be considered blameless; the unfortunate intervention of a York at Bordeaux, but for which it seems likely the Dakota would have landed there. The captain's decision to go to Le Bourget before ascertaining the weather conditions there in preference to returning to the U.K. was considered to be unwise, for it is clear that he would have had more than half an hour's fuel had he returned direct to England. The captain also failed to inform Le Bourget of his E.T.A. until six minutes before arrival and the authorities consequently had very short notice at a time when much traffic was being handled there in Q.B.I. conditions. The inability of Cormeilles to handle the aircraft at once, owing to the lack of a second channel was contributory as also was the captain's failure to ask control for further guidance after being unable to establish contact with Cormeilles. He also made an unwise decision in trying to reach England having so little fuel.

The following recommendations were made: Greater attention should be paid to crewing and crews should be made familiar with the airfields on their route, particularly with main airfields and diversionaries. It was recommended also that navigational let-down procedure information for any airfield on the route should be available in the aircraft; and that there should be a second radio channel at all airfields to make it possible to hold one or more aircraft during the handling of another. It was strongly recommended that the British and French control organizations should expedite the introduction of a scheme whereby control areas would be defined for handing over aircraft flying from one country to another.

**CEREMONY IN MANCHESTER : The Lord Mayor of Manchester asking Mr. Lindgren, third from left, to open the new Airways Terminus. The Lady Mayoress can be seen standing behind the microphone and Councillor J. E. Fitzsimons is in the foreground.**

## *B.S.A.A. AND THE TUDOR IV*

FLIGHT trials of the Tudor IV are nearly finished. A.V-M. Bennett expects only a short time to be taken on C. of A. tests and hopes to start flying the type on operations this summer. The four Mark IV Tudors will be used on the South American East Coast route to the Argentine at a frequency of once a week to replace one York service. This mark has a 6ft extension to the nose section and when loaded with 32 passengers and 550 lb of freight is expected to have a range of 3,200 miles. With the same number of passengers and 4,680 lb of freight the range is expected to be 2,780 miles.

Fuel consumption, which on the Tudor I trials was higher than expected, has now been improved by a general aerodynamic clean-up, tail buffeting has been eliminated at speeds higher than about 2 knots above stall, and various improvements have been made to reduce swing on take-off. Avro's believe that the original performance figures will be met, and in some respects exceeded. The six Tudor Mark Vs which have been ordered will eventually take over the east coast route and the Mark IVs will then be used on the route to Mexico City. There is a temporary arrangement with Mexico for opening up that route, but a bilateral agreement is being negotiated.

## *PROVINCIAL AIR TERMINUS*

ON Tuesday last week the new Airways Terminus in Manchester was officially opened by Mr. George Lindgren, Parliamentary Secretary to the Ministry of Civil Aviation. At a luncheon, attended by the Lord Mayor and Lady Mayoress, Councillor J. E. Fitzsimons, chairman of the Airport Committee, drew attention to the lead the city had taken in establishing the first airways terminus in the British Isles, outside London. The Committee, he said, had been active for twenty years, first of all in developing an airfield at Barton, and then later at Ringway. Barton was licensed as long ago as 1930, and, judged by the standards of those days, was considered to be a good site.

Mr. Lindgren, in his speech, said that the Manchester Corporation was considering whether Barton should be retained for club flying, charter and taxi work. Pending settlement of the national airfield programme, Ringway was to remain under the control of the Manchester Corporation, but contact with the Ministry would be maintained through a local representative. Mr. Lindgren also mentioned that the large hangars which had been used by A. V. Roe were at the moment not

## CIVIL AVIATION NEWS

occupied, but they were earmarked for providing a maintenance base for B.O.A.C. He was presumably referring to Tudor I servicing.

The terminus is a large prefabricated building taken from the R.A.F. Camp, Heaton Park, adapted by the city architect and erected at a cost of £2,600. It is situated on the corner of Mosley Street and St. Peter's Square on a bombed site, and will remain there for three years. There is a convenient car park at the back, and buses for the airport wait in the side street without interference to main-road traffic. Ringway is ten miles from Manchester, and the Corporation intend eventually to run buses at frequent intervals to the airport in preference to special services to meet aircraft. The interior, comprising waiting-rooms and booking-counters, has been decorated in B.E.A. colours. K.L.M. intend to do their own booking, sales, passenger and freight handling, but Air France will attend to their own booking and leave freight and passenger handling to B.E.A.C.

### *ITALIAN AIRLINE*

ABOUT the middle of last month the Italian company Airone started services between the principal cities on the Italian mainland, Sardinia and Sicily, with three-engined Fiat G.12 aircraft. Before the war twin-engined G.18s were used on Italian airlines, and the G.12, which is a development from it, carries sixteen to twenty passengers. The three Fiat engines, type A.74.R.C.40, develop a total of 2,310 h.p., and the aircraft's maximum speed is about 240 m.p.h. The range when fully laden exceeds 1,240 miles.

### *PACIFIC COMPETITION*

THE British Commonwealth Pacific Airlines' service between Auckland and Vancouver started last month with a Skymaster. The aircraft belongs to Australian National Airways, who are running the service until B.C.P.A. takes delivery of its Merlin-engined Skymasters from Canada. Five days before the aircraft was due to leave, Pan American Airways announced a weekly timetable for the route from Auckland to San Francisco which halved their previous schedule and which provides a Pacific crossing of 40 hr, 34 of them in the air. This gives an average of 175 m.p.h., including stops, for the entire flight. The new schedule cuts out the night stops at Fiji and Canton Islands. Frequency of the P.A.W.A. service between Australia and America has also been doubled. The position as it stands at the moment is that an officially subsidized British Dominion airline is providing a service across the Pacific at a quarter the frequency and half the speed of a private American company.

**INTERNATIONAL GROUP. The photograph was taken when the I.A.T.A. executive committee met in Montreal at the beginning of this month. Left to right (seated) are : Dr. Albert Plesman, President of K.L.M. ; Sir William Hildred, Director-General of I.A.T.A. ; Mr. Harold Bixby, Vice-President P.A.W.A. Standing : Mr John Slater, Chairman of A.O.A. ; Dr. Paulo Sampaio, President Panair do Brazil ; Major J. R. McCrindle, Managing Director B.O.A.C. ; Mr. A. F. T. Cambridge, Managing Director Indian National Airways ; and Mr. Rene Briend, Assistant Managing Director, Commercial, of Air France.**

### *SCANDINAVIAN AIRPORT*

SOLA AIRPORT, near Stavangar, has been selected as the main base for Scandinavian Airlines' routes to North America. The airport has a record of exceptionally good flying weather conditions. There are three runways, only one of which is over 2,000 yd, but a fourth runway is to be constructed. Alongside the airport is a convenient flying-boat harbour which has been extended and will be the main base for the Sandringhams used by D.N.L. on the internal routes to the North of Norway.

From the middle of May this year there will be six flights a week on the Atlantic service, and on June 16th the company will start a daily service between Scandinavia and New York. On April 20th one of the Skymasters flew from New York to Oslo in 17 hr 9 min. S.A.S. expect to be flying four Stratocruisers on the Atlantic route by the spring of next year.

### *TRANSATLANTIC TRAFFIC*

THE Civil Aeronautics Board in Washington have analysed and published figures for the transatlantic services during 1946. The figures allow comparison between the loads carried by the different companies operating in the North Atlantic and the number of crossings made. B.O.A.C. do not agree with the C.A.B. figures, as the London-Montreal service has not been taken into account, and during 1946 passengers were carried on that route. The three American lines carried 76.9 per cent of the total number of passengers, the other 23 per cent being carried by Air France, 5,104 passengers in 157 trips; B.O.A.C., 3,191 passengers in 183 trips; K.L.M., 4,755 passengers in 141 trips; and Scandinavian Airlines, 2,093 passengers in 100 trips.

The small number of passengers carried in the larger number of British trips is explained by the fact that B.O.A.C. are compelled to carry mail and freight at the expense of fare-paying passengers. American citizens comprised nearly 50 per cent of the total travellers during the period, as compared with the forecasts made during the war that Americans would make up 80 per cent of the traffic.

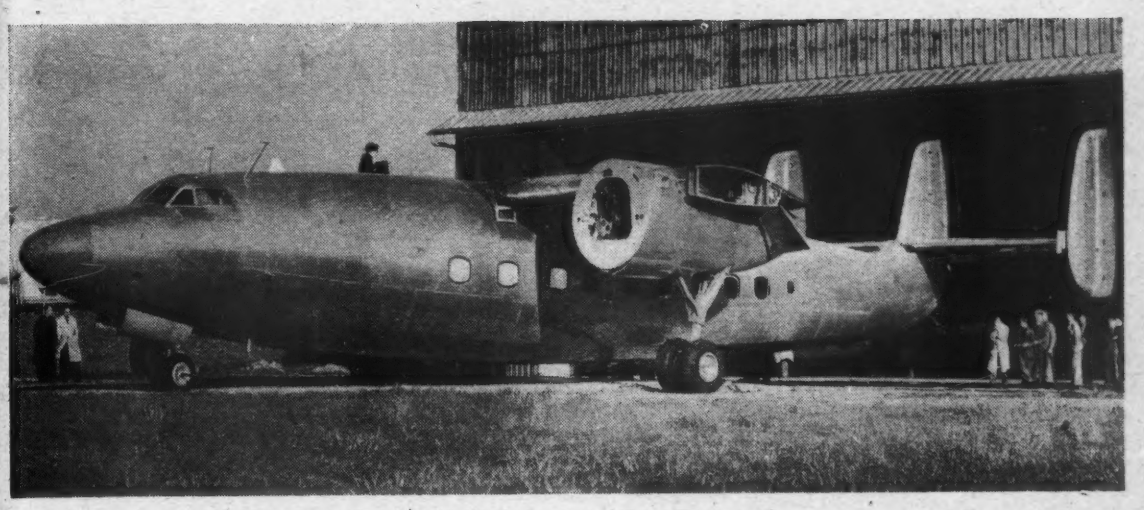
### *AIRLINES IN NEW ZEALAND*

NEW ZEALAND National Airways Corporation expects to carry about 140,000 passengers during this year. In comparison, American domestic operators expect to carry about 10,000,000 passengers, which, on a percentage of population basis, is lower. The Corporation, in which all private airlines have been merged, has a fleet of four Dakotas, twelve Lodestars, five Electras and six Dominies. About 8,500 miles are flown each day over 2,000 route miles.

Advance booking is necessary at present and aircraft are normally loaded to about 90 per cent of their capacity, but expansion is difficult owing to inadequate flying facilities and the small airfields. There is a special inter-island freight service run in conjunction with the railways for carrying perishable goods across the Strait. The Lodestars are mostly ex-Air Force transport aircraft, and there are many more to be converted when labour and materials are available.

Railway connections in New Zealand are not good owing to the nature of the country, and in consequence internal air services have considerable scope. Also the inter-island journey from Wellington to Christchurch is an all-night steamer trip, whereas by air the journey takes only 1½ hr. Auckland and Wellington both have good harbours suitable for flying-boats, and there is a suggestion that the four R.N.Z.A.F. Sunderlands should be converted for civil use on that route.

The country is not subjected to severe winter weather, and last year about 99.5



**PENULTIMATE MOVE. The Airspeed Ambassador, photographed while being moved recently from the experimental shop to the flight shed at Christchurch, is reaching its final stages of assembly. The starboard engine is installed.**

## CIVIL AVIATION NEWS

per cent of the schedules were flown. Such regularity and the airlines' good safety record have made air transport very popular in New Zealand.

### *A.O.A. BOOKING OFFICE*

MR. H. R. HARRIS, vice-president and general manager of American Overseas Airlines, was in London for the official opening of A.O.A.'s new booking office at 180, Regent Street, on May 12th. The American Ambassador and representatives of most of the British and foreign airlines and travel agencies were present. This office, which has been functioning since May 1st, is to be used for booking and reservations only, whereas arrivals and departures will be handled by A.O.A. personnel at the K.L.M. Sloane Street departure station. The American company has recently made some reductions in fare charges between Shannon, London and the Continental cities.

### *CANADAIR AGREEMENT*

EIGHT Canadians and seven Americans are on the board of directors for Canadair, formed since ownership was assumed by the Electric Boat Co., of New York. Mr. J. J. Hopkins is chairman of the board and Mr. Oliver West president of the company. General terms of the agreement entered into by the Canadian Government with the Electric Boat Co. which became effective as from September last year are as follows: the Electric Boat Co. is to provide Canadair with two million dollars working capital, and Canadair are to waive all claim or right to fees or profits from the beginning of its operations up to and including September 14th, 1946. Canadair and the Government are entering into a fifteen-year lease agreement covering plant facilities and tools, under which the company will pay an annual rental, and the Government is to assign to the company its licence agreement with the Douglas Aircraft Co. The company has also agreed to sell to the Government and Trans-Canada Air Lines twenty-four R.C.A.F.-type and twenty T.C.A.-type aircraft at negotiated fixed prices of $630,000 and $660,000 each respectively.

### *WOLVERHAMPTON AIR DISPLAY*

IN only moderate weather conditions about 3,000 people attended an "At Home" and witnessed the air display organized by the Wolverhampton Aero Club last Saturday. There were more than 70 visiting aircraft, and both the arrival prize and *Concours d'Elegance* were won by Nottingham Flying Club members. Three other prizes were won by members of the Yorkshire Aeroplane Club. Mrs. Oliver, wife of A/Cdre. Oliver, A.F.C., president of the club, presented the prizes.

Wolverhampton Aero Club is affiliated to Derby Aero Club, and is assisting in their arrangements for the international meeting to be held on June 20 and 21.

# *BREVITIES*

MR. ARTHUR DRAKEFORD, Australian Minister of Civil Aviation, was elected chairman of the general assembly of I.C.A.O. when the organization met in Montreal last week.

* * *

The Astronomer Royal, Sir Harold Spencer-Jones, has accepted nomination as president of the Institute of Navigation, and Air Chief Marshal Sir John Slessor and Sir Robert Watson-Watt have accepted vice-presidencies.

* * *

It is understood that several Bristol 170 and Vickers Viking aircraft have been transferred from the Argentine Air Forces to F.A.M.A. for foreign and domestic services.

* * *

The Ministry of Civil Aviation have decided that as from the May examination, candidates for civil aircraft navigators' licences may be allowed to take the subjects for those examinations over a maximum period of six months.

* * *

Scandinavian Airlines will use Geneva instead of Paris as an intermediate stop on the South American route as from May 17th. The overnight stop at Rio de Janeiro will be abolished.

The president of Peruvian International Airways has stated that his company is interested in establishing a service between Montreal and Lima, overflying U.S. territory. The company already have six DC-4s and are now considering the purchase of some DC-6 aircraft.

* * *

The Polytechnic Touring Association have chartered Viking aircraft from Airwork for tourist flights to the Continent. The first Viking left last week, and already 1,300 bookings have been made for the 2,400 seats available on the tours. Airwork have taken delivery of two Vikings out of their total order for six.

* * *

Pacific Overseas Airlines, Siam, has been formed with American pilots to fly a weekly service between California and Bangkok, starting on May 20th. Operations will later be extended to Singapore, Saigon, Hong Kong, Shanghai and Manila.

* * *

Mr. La Motte T. Cohu, chairman and general manager of Northrop, has been elected president of Trans-World Airlines

# CIVIL AVIATION NEWS

in succession to Mr. Jack Fry. Mr. Warren Lee Pierson, president of the American Cable and Radio Corporation, has been made chairman of the board and managing director of the International Division.

## FROM THE CLUBS

THE municipal airport, Southend-on-Sea, is now fully operational, and full servicing facilities are available including 73 and 80 octane petrol. Despite bad weather the school has completed its first month of operation, and statistics reflect a very satisfactory start. During the month of April fifty members have been registered, and a total of over 100 flying hours has been completed. Two "A" Licences have been renewed, and one new "A" Licence obtained. Many of the *ab initio* pupils are nearing completion of their "A" Licence and providing the weather is kind many first solos may be expected next month.

* * *

The Wiltshire School of Flying is now settled in at Thruxton and is expecting a busy season. The new clubhouse is practically completed, a catering licence has been obtained and residential accommodation is available to members. During the past twelve months more than 2,000 hours were flown, and ninety-five "A" licences, one instructor's licence and a "B" licence were obtained by members. This is a good effort in view of the handicap imposed upon the club when at High Post, Salisbury, where flying was banned until 5 p.m. during the week, and on Saturday mornings. A year ago the club had one instructor and one Auster but now they have four instructors and ten aircraft.

* * *

There was a good attendance of past and intending members at the first post-war meeting of Redhill Flying Club on May 4th. Mr. Graham Douglas, the chief organizer, and managing director of British Air Transport, introduced the C.F.I., Mr. J. K. Maxwell, and the instructors, Mr. A. S. Burridge, Mr. H. T. Molyneux, also the airfield manager, and Mr. C. Nepean Bishop.

The airfield is still requisitioned by the M.C.A., but Mr. Douglas is expecting an early release. Until that time, no flying instruction can be given. Subscription for flying members is £3 3s, and the rates are £3 10s dual and £3 solo. The club has three Magisters and four Auster Autocrats.

The Surrey Gliding Club, of which Mrs. Ann Douglas is the organizer, is already very active at Redhill and is functioning with two Kirby gliders and one Olympia. Two more Olympias are expected.

* * *

Light aircraft clubs have received invitations to attend the first post-war Garden Party of the Bristol and Wessex Aeroplane Club next Saturday, May 17th. The varied programme planned includes an arrival competition to take place between 1400-1500 hr, flying displays and a competition for the best-turned-out aircraft and passenger. Servicing facilities and hangarage can be provided, as can 73-, 87- and 100-octane fuel and proprietary brands of oil.

* * *

A revival of a pre-war club practice will take place on Sunday next, the 18th, organized by the Herts and Essex Aero Club. It takes the form of a "Breakfast Patrol" between 0900-0930 hr. A radius of two to four miles from base will be patrolled by defending aircraft, and raiders must cross this area at a height between 1,000 and 2,000ft without having their registration numbers taken. Those who succeed will be rewarded with a free breakfast. Members of all other clubs and private owners are invited to participate in the "raid."

* * *

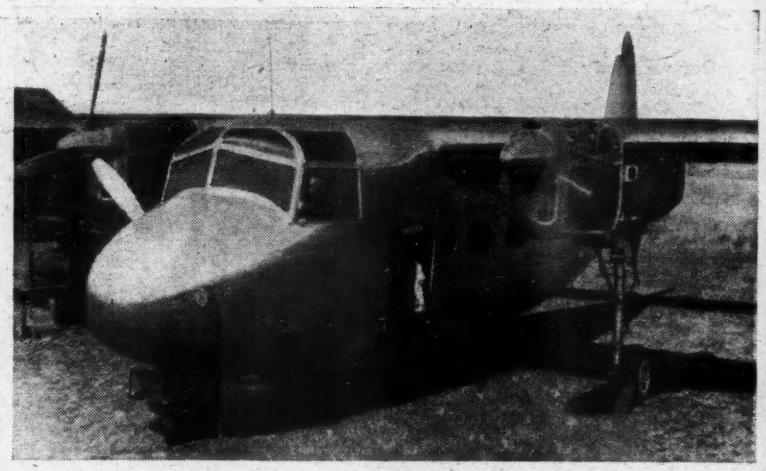
Yorkshire girls have taken up enthusiastically the work of the W.J.A.C. There are now sixteen units of the W.J.A.C. in Yorkshire. Their campaign to make the young women of England air-minded includes a three-year Air Training Course, comprising a simplified version of a pilot's ground training. Scholarships enable the most promising members to take their pilot's "A" licences.

* * *

A flying meeting has been arranged for June 28th by the Luton Flying Club, who hope to attract a large public to the meeting. Flying displays are part of the programme, and pleasure flights will be available in the club aircraft. Mr. Rumble, formerly test pilot at Napiers, has joined the Luton club as an instructor. During the war Mr. Rumble worked with the R.A.F., flight-testing many captured German aircraft, and there is no doubt that his experience will be a great asset to the club.

* * *

We hear from New Zealand that club flying there is well under way again. Backbone of club equipment appears to be reconditioned ex-E.F.T.S. Tiger Moths, with Proctors, Austers and Whitney Straits also popular.



**TAKE-OFF IMMINENT. The Gipsy Queen 51 engines on the Merganser prototype being tested prior to taxying trials at Luton last week. The first flight is expected tomorrow. Owing to a hold up in Gipsy Queen engine deliveries, Percivals are going ahead with the slightly larger P.50 Prince, powered by two Leonides.**

**FLY FISHERS: One way of carrying a small boat for a fishing expedition in remote waters.**

# CORRESPONDENCE

*The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.*

## STORMY WEATHER

### *Need for Emphasis*

YOU know that Kings Regulation which prescribes that once every three months those bits about V.D. and gambling shall be read out to all ranks on parade?

Just so. I feel a law should be passed compelling you to reprint "Vertigo's" article "Stormy Weather" in every fourth issue of *Flight*—at least until it ceases to be so horribly and compellingly true. "AIRLINE PILOT."

### *Standardization Not So Easy*

I HAVE read and re-read the article "Stormy Weather" by "Vertigo" in your issue of May 1st and would like, through the medium of your columns, to offer criticism of certain remarks made therein.

I should point out here that I am at a particular disadvantage inasmuch as I am a "ground man" and not a "driver," thus providing material for "Vertigo" and his confederates to emphasize my lack of appreciation of their duties.

However, I must equally point out in defence of the men who create these "Wellsian" panels of instrumentation that every consideration is given to the user—chiefly as regards his requirements and advice.

"Vertigo" goes on to say that he would like to see some form of standardization in "office" layouts. Yes, a desirable state of affairs indeed, but he must bear in mind that each type of aircraft is designed with the idea of gaining the maximum possible efficiency in all directions, whether for civil or military use; thus the cockpit often suffers when space has to be found for yet another but necessary "gadget."

Rest assured that sheer human cussedness is not the reason for that at which you apparently gaze in awe and wonder. It is the result of careful planning and an effort to attain a high safety factor. K. R. STANTON.

## AIRCRAFT STATISTICS

### *Passenger-miles Basis Defended*

IN looking over *Flight* for January 9th, 1947, I was interested in the article "Misleading Statistics." I do not know what substitutes for statistics based on passenger-miles this journal may have previously suggested, although it would be interesting. This criterion definitely leaves much to be desired but nevertheless so far as I know it is the best yardstick thus far available.

To this article itself, which *Flight* refers to as sound, I take strong exception. The contention that accident statistics should be based on the number of people carried regardless of the distances involved cannot be supported. If it could, the small line that carried a hundred passengers a hundred miles with, let us say, one casualty, would have done just as good a job as the large line which carried the hundred passengers 5,000 miles with one casualty. It would not be argued that the value of the service was the same in each case, and the difference in fare reflects that. Nor would it be argued that the amount of risk was the same.

Eventually we may be justified in deciding that the risk occurs only at certain times as, for example, in landing and take-off, while the rest of the time is comparatively safe. I do not think any such conclusion is warranted at present. If it ever is, a long non-stop flight with only one landing and one take-off would then be very much less hazardous than a relatively short flight with a number of intermediate stops. To attempt to compare this with railroad operation, it would probably be necessary to consider that the danger existed only on curves, at crossings, intersections, etc. To apply the same theory to automobiles would be to argue that the danger existed only on curves, at crossings, on crowded streets, etc. Any such arrangement would result in a thousand different approaches and exceptions to the problem and practically rule out any comparison between types of transportation. That really would give the boys with the sharp pencils a chance.

The article starts out with the assumption that the criterion of passenger-miles resulted from the fact that 20 years ago the number of persons carried by aircraft per fatality was so much less than those by other means that something had to be done to make a better comparison. Twenty years ago aviation was in its infancy and air transport, as we know it to-day, had not even been born. For that reason, as well as because the degree of exposure to risk was probably not the same in all the categories mentioned, the comparison of fatalities means nothing.

Accident insurance is based on risk incurred, and the premium increases with the time involved because the risk also increases. For obvious reasons accident insurance does not take into account a complicated computation of how long a person is on the road in his car. On the other hand, if his car is laid up during the year his risk decreases and there is a rebate on the premium. Similarly, after the first year has elapsed there is an increase in the risk and another premium has to be paid. All of this adds up to the fact that the time exposed to risk is here used as a criterion.

With an aircraft making 200 miles an hour, for example, and a ship making 20, the passenger on the latter would require ten times as long to complete his journey. Suppose he travelled 2,000 miles in each case. If the hazard here were based on time it would presumably be ten times as great for the ship which does not make sense. As between two trips by aircraft, one at 150 m.p.h. and another at 300 m.p.h., the risk would be twice as great on the slower aircraft. This may be questioned, for added speed is generally, in certain respects, at least, an added hazard.

In attempting to compare methods of transportation in which the speeds are so divergent, it appears to me that the only common denominator is distance travelled. It is far from perfect, but what better system is there? Finally, the idea that the airlines do not wish to know or wish to conceal the actual facts regarding their accidents is, in my opinion, absurd. It is their business and their money that is at stake and the only person who could be more interested is the passenger, although as the article remarks, about automobiles, the high accident rate does not seem to deter them there.

J. W. REEVES, JR.
Rear Admiral, United States Navy;
Commander, Naval Air Transport Service.

## CONGO BOUND

### *M.C.A. Briefing Units*

I AM extremely interested in D. W. Weaver's claim to have experienced a 30 deg drift when encountering a 30 m.p.h. wind. If this is correct his T.A.S. must have been somewhere in the neighbourhood of 55 m.p.h. If, however, his T.A.S. was near the more probable figure of 90 m.p.h., then a 30 m.p.h. wind would give a drift of approximately 20 deg.

Concerning his claim that A/F information was not available in London, did he try the Ministry of Civil Aviation, or one of the M.C.A. Briefing Units? In matters of this type they are rarely found wanting. NAVIGATOR TYPE.

### *Delivery of an Auster to Bombay*

MY experiences during the first half of a delivery flight to Bombay were similar to those of D. W. Weaver as told in "Congo Bound."

I agree with Weaver that the difficulties encountered at the Egyptian Consulate in London were very trying and unnecessary. I happened to be the first pilot to bring this subject to the notice of the Ministry of Civil Aviation.

Concerning the difficulty Weaver had in getting airborne at dawn, I found this task very easy—in fact, the only people who showed their displeasure were the R.A.F., who, after all, like their extra hour in bed.

The route followed was almost similar, except that "ropey" weather in France forced me down at Amiens. From Nice, Corsica was skirted and after landing at Caglian, Sardinia, to refuel, I flew on to Tunis for the night.

I endeavoured to make Benina the following day, but, instead, landed at the once famous Marble Arch airfield, where the only sign of life was two Arab employees of "Shell." The night was spent in the Auster, not a feat which I would recommend as a regular occurrence.

From Marble Arch I flew direct to El Adem, a trip of some 4½ hours' duration over completely barren desert. As Weaver put it "El Adem was heralded by all kinds of debris of the former battlefield," but even more interesting, or shall we say amazing, were the millions of vehicle tracks which were still very much in evidence. PETER BAGSHAWE.

# SERVICE AVIATION

## *Launch of H.M.S. "Albion"*

H.M.S. *Albion*, a light fleet carrier, was launched on Tuesday, May 6th, by Mrs. C. R. Attlee, at the shipbuilding and engineering works of Messrs. Swan Hunter and Wigham Richardson, Ltd., Wallsend-on-Tyne. H.M.S. *Albion* is a sister ship of H.M.S. *Centaur*, launched on April 22nd, 1947, and her design embodies all the features of that ship.

## *Chaplain-in-Chief Returns*

THE Chaplain-in-Chief of the R.A.F., the Rev. J. A. Jagoe, has now returned from a two-month tour by air of the R.A.F. in India, Burma, Malaya, China and Japan, during which he held conferences with R.A.F. chaplains, conducted services, mixed extensively with officers and men and conferred with the Metropolitan of India and the Bishops of Rangoon and Singapore.

## *C.B.E. Display*

A DISPLAY at the Central Bomber Establishment, R.A.F. Marham, last Saturday week, raised £250 for the Lord Mayor's Mansion House Fund for people in the Norfolk and Cambridgeshire areas. Aircraft on show included a Lincoln, a Meteor, and a Spitfire. The Lincoln II *Excalibur*, lately returned from Australia and New Zealand was present, with her sister Lincoln *Crusader*, now back from South America. A Meteor and a Harvard gave displays.

A barrage balloon was hoisted to attract the crowds and there was a static display and a non-stop cinema. The Air Officer Commanding No. 3 Group presented prizes at a dance.

**PRODUCTION SEA FURY : A recent view of a Hawker Sea Fury X (Bristol Centaurus XVIII) just off the production line at Langley. This excellent type will be used by British Naval Aviation and by the Royal Canadian Navy and Royal Netherlands Navy.**

## *Army v. R.A.F. Boxing*

THE British Air Forces of Occupation *versus* British Army of the Rhine Boxing Tournament held under I.S.B.A. rules, took place at Bad Eilsen, Air Headquarters, Germany, on Thursday, April 24th, the R.A.F. defeating the Army by 13 points to 8. The programme included four R.A.F. exhibition contests refereed by S/L. J. M. Ritchings,

## *Royal Air Force and Naval Aviation News and Announcements*

followed by the eight tournament contests, refereed by S/L. J. Allan. All the bouts consisted of three rounds of two minutes. Major E. J. Woodcock and S/L. J. Halliday adjudicated.

F/S. Carrell, 2829 R.A.F. Regiment, defeated Cpl. Allan, R.E.M.E., in the opening flyweight bout, scoring the first two points for the B.A.F.O. team. There was no lack of action in the bantamweight contest between Pte. Stevens, 1st Batt. Royal Manchester, and Sgt. Bryden, of 85 Wing. Sgt. Bryden was awarded the second win for the R.A.F. In the featherweight class, Pte. Mapleton, 1st Royal Norfolk, defeated A/C. Coughlin, of 84 Group.

In the third round of the lightweight bout between Pte. Brogden, 1st Battn. East Lancs, B.A.O.R. Champion, and A/C. Marr, 2 Group, Marr knocked Brogden to the canvas for a brief period and brought the B.A.F.O. score to 7 points.

The welterweight contest between Pte. Springett, 2nd Royal West Kent, and Sgt. Sharpe, 139 Wing, was fought mostly in clinches, but the middleweight contest between Pte. Brown, A.F.S. 84 Group, 1947 B.A.O.R. Champion, and A/C. Hazell, 2 Group, was one of the finest exhibitions of the evening. A/C. Hazell was acclaimed winner.

In the lightweight bout, Sgt. Binder, 1st Forester, met F/S. Edwards, 84 Group. Sgt. Binder was unfortunate enough to slip in the ring, sustaining a twisted ankle. Cpl. Walsh, A.H.Q., B.A.F.O., defeated Sgt. McGrindle, 3rd R.H.A., in the early part of the second round of the final bout.

## *Latest Radio-Sonde*

A NEW radio-sonde, similar in principle to that used during the war, but completely redesigned for quantity production, is being brought into use by the meteorological office. Weather changes are converted into changes in the pitch of a musical note.

The radio-sonde, complete with battery, weighs 3 pounds. At the receiving end the pitch of the musical note is measured very accurately.

Radio-sondes are at present being flown up to four times daily at nine stations in the British Isles from Penzance to Shetland, and stations are

## SERVICE AVIATION

being opened along all the main Empire air routes. They will also be used on the ocean weather ships which are due to start making weather observations in the Atlantic in July. This radio-sonde is probably the most accurate in routine use in any country at the moment.

A still more accurate apparatus is being developed. It is called the chronometric or time-measuring radio-sonde, because the indications of the three meteorological instruments are converted into the intervals of time between a series of electrical contacts. Each instrument moves a contact, and the observation consists in measuring the time taken by another contact driven by a small electric motor to pass from one contact to the next.

### *Demonstration for French*

A SQUADRON of the British Air Force of Occupation, Germany, went south recently to visit the French School of Air Support at Friedrichshafen.

Equipped with Tempest V aircraft, and led by their Commanding Officer, S/L. H. E. Walmsley, D.F.C., the squadron gave a demonstration of rocket and cannon firing before a number of high-ranking French Army and Air Force officers. During their four-day visit the pilots were hospitably entertained by the French Air Force. Aircraft of Transport and Fighter Commands also participated.

### *Wanted—500 "Met." Assistants*

BY the end of June the Air Ministry needs 500 civilian meteorological assistants to replace Service personnel who are being demobilized.

The posts are open to men and women between the ages of 16 and 27 whose education is up to School Certificate credit standard in mathematics or science, as well as to older candidates who have been meteorologists in the R.A.F. or the Royal Navy and who may be of any age up to 50. In the past meteorological assistants have been recruited only on a temporary basis, but although they will still enter on this basis they will now be given opportunities of competing for pensionable posts in the Assistant (Scientific) Class of the Civil Service and of promotion to a higher grade. Rates of pay have also been improved and vary between £155 and £350 according to age, sex and location.

**HONOUR FOR D.P.R.: Air Chief Marshal Sir Philip Joubert, Director of Public Relations at the Air Ministry, receiving the U.S. Legion of Merit from Major General Clayton L. Bissell on May 5th.**

### *General Piollet to Lord Tedder*

AT the conclusion of his visit to this country General Piollet, Chief of the French Air Staff, sent a personal message to Marshal of the Royal Air Force Lord Tedder, Chief of the Air Staff, in which he said:—

"As I leave British territory, in an aircraft which you have placed at my disposal, I should like to thank you for the very friendly welcome which you gave us and for an interesting visit. May I request you to convey my thanks to the Air Minister, to the members of the Air Council and to the officers in command of the units and stations which we had the honour and the pleasure of visiting. May I send you personally my kind regards and best wishes for recovery."

**OPERATION SPEARHEAD: The scene at the Staff College, Camberley, when Operation Spearhead—a study of combined operation in the light of war experience—commenced. With Field-Marshal the Viscount Montgomery are Vice-Admiral Sir Patrick Brind, Air Marshal Sir James Robb and General Sir John Crocker.**

### *Battle of Britain Memorial*

DEMOBILIZED flying personnel of the R.A.F. and Fleet Air Arm who fought in the Battle of Britain (July 10th to October 31st, 1940) are invited to apply, not later than May 31st, for seats at the ceremony of the unveiling by the King of the Battle of Britain Chapel, Westminster Abbey, on July 10th. Applicants must state their number, rank, full name and squadron. If the number of applicants exceeds the number of seats, it may be necessary to resort to a ballot.

### *More Flying for the A.T.C.*

IN furtherance of its policy of getting A.T.C. cadets into the air whenever possible, R.A.F. Reserve Command has arranged for cadets to fly in Tiger Moths of the new R.A.F.V.R. Flying Schools. When all the schools are operating, every cadet holding a proficiency certificate will have at least one 20-min flight a year.

The first four Reserve Flying Schools (civilian operated) opened last month at Woodley (Reading), Brough (Hull), Derby and Perth, and seven more are due to open in the immediate future. Eventually twenty-five schools will be established in all parts of the United Kingdom.

### *Badge for Air Command, Far East*

PRESERVED during the Japanese occupation of Malaya, the original badge of Royal Air Force Headquarters, Far East, signed by H.M. the King in November, 1937, is now to be the badge of Headquarters, Air Command, Far East, which was reconstituted early this year out of the wartime Air Command, South East Asia. The original hangs in

## SERVICE AVIATION

the Command Headquarters at Changi and beside it will be placed a new badge, identical in every respect except for the slight difference in the title of the command. It depicts on two krises in saltire, a Chinese junk in full sail, and encircling the badge is the inscription "Royal Air Force. Headquarters Air Command Far East." On a scroll beneath is the motto, "Eastward."

### *Bournemouth Adastral Club*

THE Bournemouth Branch of the Royal Air Force Association has now acquired headquarters, and after redecoration the Adastral Club is open to ex-R.A.F. personnel. A. Cdre. Croke, C.B.E., is president, and the Hon. Sec. is S. C. Cotterel, Adastral Hall, 47, Sea Road, Boscombe, Bournemouth.

### *Gratuity for S.S. Officers in Education Branch*

OFFICERS now being appointed to short-service commissions in the R.A.F. Education Branch will be eligible for a gratuity of £562 10s on completion of five years' service. This rate will apply to all appointments made as a result of completed application forms received in the Air Ministry up to June 30th, 1947. Candidates whose applications are received after that date will qualify for the normal gratuity payable to short-service officers, which is £500 for five years' service.

### *Londoners and the R.A.F.V.R.*

EX-R.A.F. flying personnel living in the London area who obtained their wings in the Service and have been released can now join the R.A.F. Volunteer Reserve. Recruiting for those who live north of the Thames has already started; ex-pilots living in South London can join almost immediately.

The addresses to which they should apply are:—

*North London.*—The Commandant, No. 83 Reserve Centre, Stanmore Park, Middlesex.

*South London.*—The Commandant, No. 84 Reserve Centre, Chessington, Surrey.

The airfields from which the pilots will fly are Panshanger, near Hertford (for N. Londoners), and Fairoaks, Surrey (for those south of the river).

The Reserve Flying Schools will be equipped with Tiger Moths until a more modern type of trainer is available. Theoretical and synthetic training will be given at the Reserve Centres at Chessington and Stanmore Park.

An annual retaining fee of £35 is granted to all R.A.F.V.R. pilots, as well as the same rates of pay and marriage allowance as regular personnel when on annual continuous training. Applicants for the R.A.F.V.R. must be British subjects, and except in certain cases, under 30 years of age. They will be required to produce their flying log books, which can be obtained from Air Ministry (Archives), Nestles Avenue, Hayes, Middlesex. Fuller particulars can be obtained from the Commandants of either of the two Reserve Centres. Ex-pilots are particularly requested to state their rank and Service number when applying.

Later those who served as navigators, signallers, flight engineers, gunners, and in ground trades will be able to join the Volunteer Reserve.

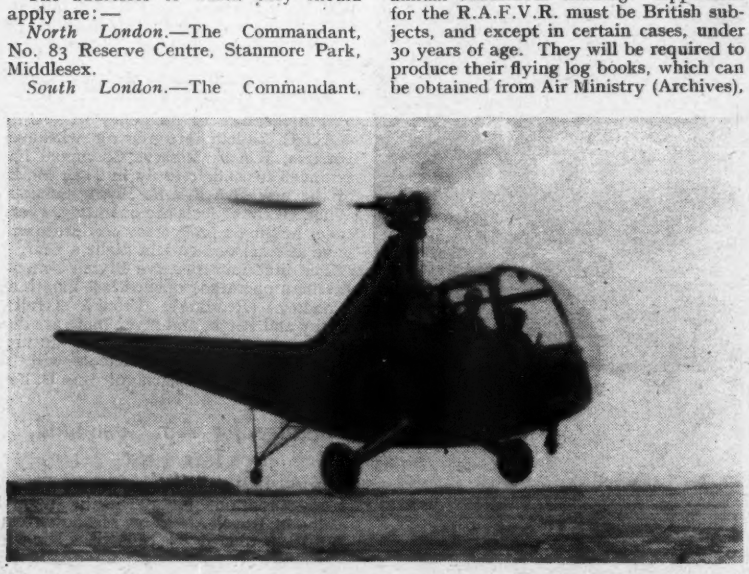
**HUDDLE AT HULLAVINGTON: S/L. Upton, R.C.A.F., speaks into the Link microphone at the Empire Central Flying School, Hullavington, Wilts, where intensive training for all-weather flying is given to Service and civilian pupils. With him are S/L. K. Mackenzie and S/L. W. Hampson.**

### *New R.N.V.R. Air Squadrons*

FOUR R.N.V.R. Air Squadrons are now being formed. The first is a fighter A/S Squadron, based at the Royal Naval Air Station, Abbotsinch, near Glasgow, to be manned by pilots and observers. The other three are fighter squadrons in which only pilots will be required. The second to be formed will be at the R.N.A.S., Culham, for the London-Oxford area. The location of the others has yet to be decided.

The number of applications to join these squadrons is expected to be heavy, and for the present enrolment is confined to R.N.V.R. pilot and observer officers who have had front-line flying experience during the war, and to a limited number of air engineer officers.

Entry is restricted to officers between the ages of 20 and 30, although officers who have held command of front-line squadrons will be accepted up to the age of 33 and air engineer officers up to 35. The initial period of service will be for five years. Further details and enrolment application forms can be obtained from the Admiral Commanding Reserves, Queen Anne's Mansions, St. James's Park, London, S.W.1.



**HOVERFLY II: A Royal Artillery officer, of 1901 Flight, 657 A.O.P. Squadron, R.A.F., flies one of the new Sikorsky Hoverfly II helicopters. In the U.S.A. this type is known as the R-6A.**

### *Reunion*

NO. 41 SQUADRON Old Comrades' Association notifies all ranks who have served with the Squadron since its inception in 1917 of a reunion dinner to be held in London on May 31st, 1947. Tickets, price 15s 6d, from The Secretary, 41 Squadron, R.A.F. Church Fenton.